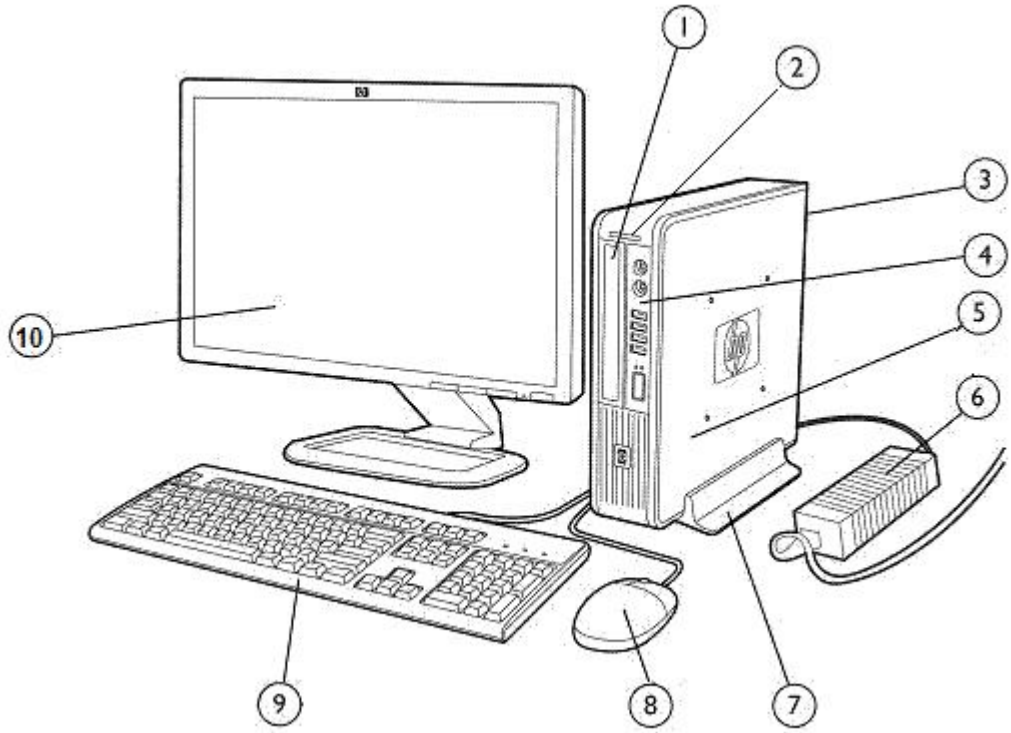
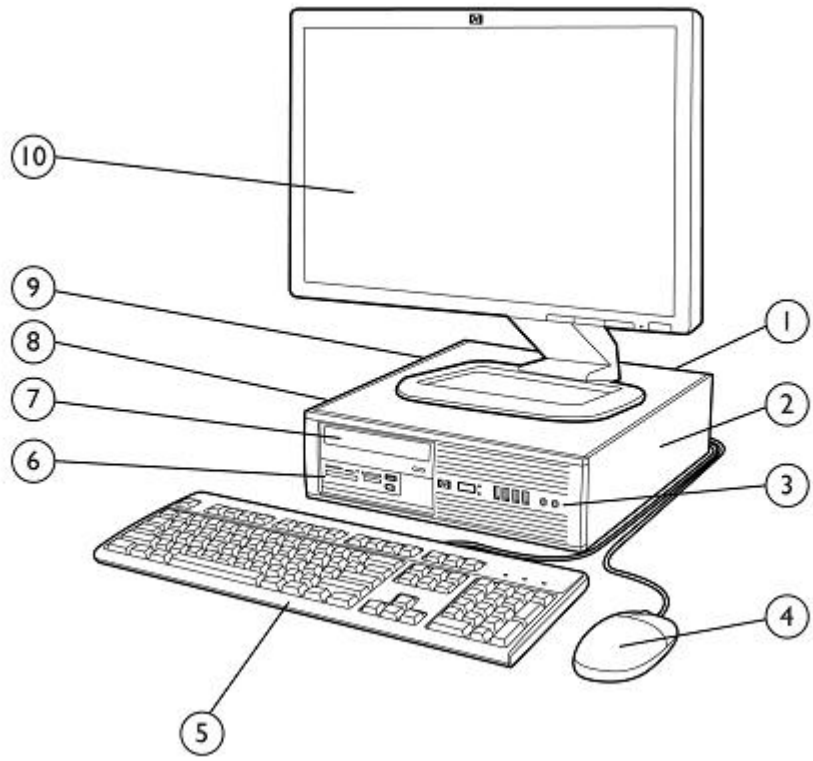
HP Compaq 8000 Elite Ultra Slim Desktop Business PC



1 Optical Disc Drive
2 Secure Digital (SD) Card Reader
3 Rear I/O includes (6) USB 2.0 ports, DisplayPort and VGA video interfaces, PS/2 mouse and keyboard ports, RJ-45 network interface, audio in/out jack
4 Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack
5 2.5" internal hard disk drive bay
6 135W 87% efficient external Power Adapter
7 HP USDT Tower Stand (sold separately)
8 HP Optical Mouse
9 HP Keyboard
10 HP Monitor (sold separately)

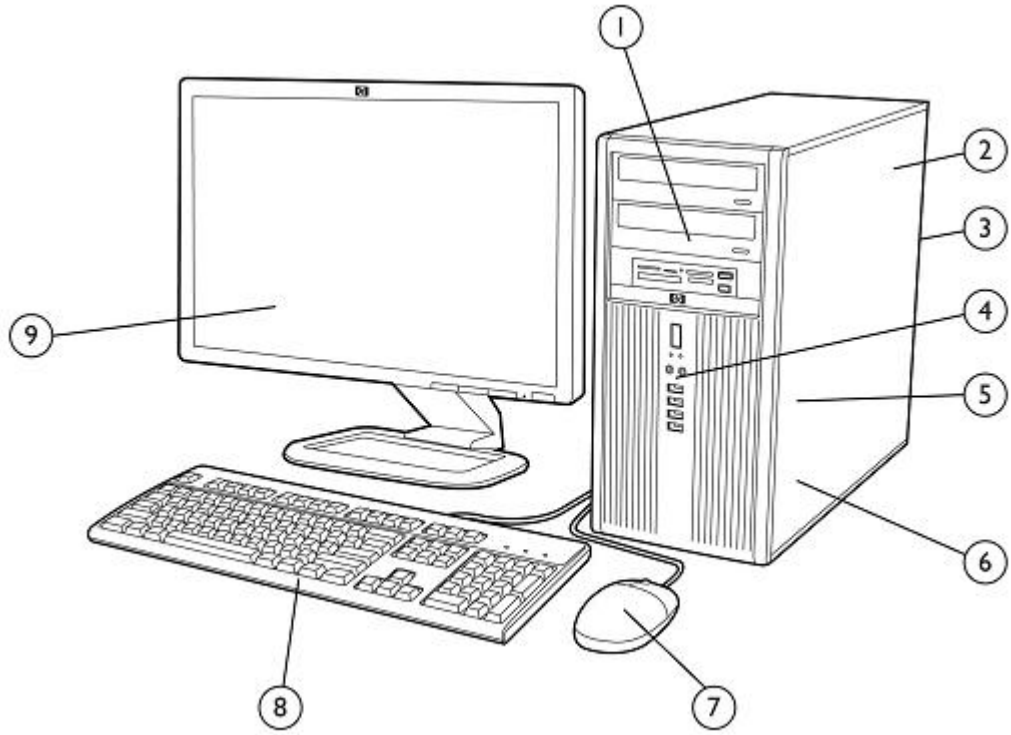
HP Compaq 8000 Elite Small Form Factor Business PC



1 Rear I/O includes (6) USB 2.0 ports, serial port, PS/2 mouse and keyboard ports, RJ-45 network interface, DisplayPort and VGA video interfaces, and audio in/out jacks
2 Low profile expansion slots include (1) PCI slot, (2) PCI Express x1 slots and (1) PCI Express x16 graphics slot
3 Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack
4 HP Optical Mouse
5 HP Keyboard
6 3.5" external drive bay supporting a media card reader or a secondary hard disk drive
7 5.25" external drive bay supporting an optical disk drive
8 3.5" internal drive bay supporting primary hard disk drive
9 240W standard or 89% high efficiency Power Supply
10 HP Monitor (sold separately)

Overview

HP Compaq 8000 Elite Convertible Minitower Business PC



1 (3) 5.25" external drive bays supporting optical disk drives, removable hard disk drives, or the HP Media Card Reader
2 320W standard or 89% high efficiency Power Supply
3 Rear I/O includes (6) USB 2.0 ports, serial port, PS/2 mouse and keyboard ports, RJ-45 network interface, DisplayPort and VGA video interfaces, and audio in/out jacks
4 Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack
5 (3) 3.5" internal drive bays supporting multiple hard disk drives
6 Full height expansion slots include (3) full-length PCI slots, (1) PCI Express x1 slot, and (2) full-length PCI Express x16 graphics slots
NOTE: Second PCIe x16 slot has x4 connectivity.
7 HP Optical Mouse
8 HP Keyboard
9 HP Monitor (sold separately)

Overview

At A Glance

- Designed for long-term deployment within corporate, enterprise, public sector and mid-market commercial organizations
- Choice of three professional chassis form factors to accommodate any desired mix between expandability and size
- BIOS developed and engineered by HP for better security, manageability and software image stability
- Intel® Q45 Express chipset featuring integrated GMA 4500 integrated graphics
- DDR3 Synchronous Dynamic Random Access Memory (SDRAM)
- Intel® Core™ 2 Processor with vPro™ Technology (requires select processors)
- Supports industry standard management protocols including Intel Standard Manageability and DASH 1.1 (via optional Broadcom NIC card)
- Integrated dual independent monitor support via both a VGA and DisplayPort video interface
- Standard efficiency or 89% high efficiency energy saving power supplies available on the CMT and SFF models
- 87% efficient energy saving external power adapter standard with USDT models
- ENERGY STAR qualified models available (dependent upon the desired configuration)
- CMT and SFF models can be configured with multiple hard disk drives in a RAID array
- Guaranteed lengthy purchase lifecycles and image stability
- Software image fully compatible across all models and form factors
- Created using industry leading Design for Environment standards
- Selected configurations with global availability easily set up and ordered through HP.com Business to Business portals (http://h10019.www1.hp.com/business-site/index.html)
- Tailored HP Factory Express deployment and lifecycle services available (http://h71028.www7.hp.com/enterprise/cache/97688-0-0-225-121.aspx)
- Protected by HP Services, including standard warranties up to 5-5-5 (terms and conditions vary by country; certain restrictions and exclusions apply)
- Tool-less serviceability features for easier upgrades and repairs

Standard Features and Configurable Components (availability may vary by country)

Operating Systems

Preinstalled	Genuine Windows Vista Business (32-bit)[1] Genuine Windows Vista Home Basic[1] Genuine Windows 7 Home Basic Edition (32-bit)[2] Genuine Windows 7 Home Premium Edition (32-bit or 64-bit)[2] Genuine Windows 7 Professional Edition (32-bit or 64-bit)[2] FreeDOS
Supported	Genuine Windows Vista Enterprise Edition[1] Genuine Windows 7 Enterprise Edition[2] Genuine Windows 7 Ultimate Edition[2]
Certified	Novell SUSE Linux Enterprise Desktop 11† Red Hat Enterprise Linux 64††

[1] Certain Windows Vista product features require advanced or additional hardware. See www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and www.microsoft.com/windowsvista/getready/capable.mspx for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: www.windowsvista.com/upgradeadvisor

[2] System may require upgraded and/or separately purchased hardware and/or a DVD drive to install the Windows 7 software and take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

† The following features are not supported by Novell SUSE Linux Enterprise Desktop:

- HP 22-in-1 Media Card Reader with PCI Card
- DisplayPort
- HP ProtectTools
- SATA Blu-ray Writer playback of commercial movies
- Intel Gigabit CT Desktop NIC
- Broadcom NetXtreme Gigabit Ethernet PCIe NIC Plus Card
- HP ADD2 SDVO PCIe DVI-D adapter
- 2nd serial port adapter (including low profile)
- Power Management features (US ENERGY STAR)

†† The following features are not supported by Red Hat Enterprise Linux 64:

- HP 22-in-1 Media Card Reader with PCI Card
- Integrated 1.2 TPM Embedded Security Chip
- Intel Gigabit CT Desktop NIC
- Broadcom NetXtreme Gigabit Ethernet PCIe NIC Plus Card (DASH functionality)
- LSI PCEe x1 Hi-Speed 56K International SoftModem
- HP ADD2 SDVO PCIe DVI-D adapter
- HP FireWire / IEEE 1394 PCI Card (full height and low profile)
- 2nd serial port adapter (including low profile)
- HP Wireless 802.11b/g/n PCIe x1 Card
- HP USB Smartcard Keyboard
- Power Management features (US ENERGY STAR)

Standard Features and Configurable Components (availability may vary by country)

- SATA Blu-ray Writer
- Broadcom NetXtreme Gigabit Ethernet Plus (DASH 1.1) PCIe NIC Card
- ATI Radeon HD 4550 Dual Head PCIe x16 Graphics Card
- ATI Radeon HD 4650 (1 GB DH) PCIe x16 Graphics Card
- NVIDIA GeForce 310 DP PCIe x16 Graphics Card
- Nvidia Quadro NVS 290 Graphics Card
- NVIDIA Quadro NVS 295 (256MB DH) PCIe x16 Graphics Card

Value Added Software (included with all models; not included when configured with FreeDOS)

HP ProtectTools Security Suite
HP Software Management Agent
Computrace for Desktops agent (optional)
HP Insight Diagnostics
PDF Complete

Value Added Software (included with select models; not included when configured with FreeDOS)

Computer Setup Utility
Antivirus software*
Roxio Creator Business
HP Power Manager
HP Total Care Advisor
Microsoft Office 2010 preloaded (purchase of a Product Key required to activate a full Office 2010 suite)**
Firefox HP Virtual Browser
Corel WinDVD

* May be Norton or McAfee antivirus software. First 60 days included. Subscription required for live updates thereafter. Internet access required.
** Microsoft Office 2010 Preloaded includes reduced functionality versions of Word and Excel. Purchase of Product Key required to activate full Office 2010 suite available at participating resellers/retailers and http://www.office.com.

HP Client Management Solutions (available for free download from the Internet) http://www.hp.com/go/easydeploy)

HP Client Automation Starter*
HP SoftPaq Download Manager
HP Client Catalog for Microsoft SMS
HP Systems Software Manager

* Available from your HP Sales Representative or HP Channel Partner

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Value Added Services and Features

HP Stable Platform Program
Intel Stable Platform Program
Business-to-Business Portals
HP Global Series Services
Factory Express Deployment and Lifecycle Services
Intel Standard Manageability
Intel Core 2 Processor with vPro Technology
Trusted Platform Module (TPM) v1.2*

* TPM module disabled where restricted by law, i.e. Russia.

Service and Support

On-site warranty and service[1]: This limited warranty and service offering delivers parts, labor and on-site repair for terms up to 5 years. Response time is next business day[2] and includes free telephone support[3] 24 x 7. Global coverage[2] ensures any product purchased in one country and transferred to another non-restricted country will remain fully covered under the original warranty and service offering. Some countries/regions do not offer one year onsite and labor.

[1] Terms and conditions may vary by country. Certain restrictions and exclusions apply.

Standard Features and Configurable Components (availability may vary by country)

[2] On-site services may be provided pursuant to a service contract between HP and an authorized HP third party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.

[3] Technical telephone support applies only to HP configured, HP and HP qualified third party hardware and software. Toll-free calling and 24 x 7 support may not be available in some countries.

Chipset	USDT	SFF	CMT
Intel Q45 Express with Intel GMA 4500 Graphics	X	X	X

Processor	USDT	SFF	CMT
Intel Celeron Processors			
Intel Celeron E3200 Processor 2.40 GHz, 1M L2 cache, 800 MHz FSB	X	X	X
Intel Celeron E3300 Processor 2.50 GHz, 1M L2 cache, 800 MHz FSB	X	X	X
Intel Celeron E3500 Processor 2.70 GHz, 1M L2 cache, 800 MHz FSB	X	X	X
Intel Pentium Processors:			
Intel Pentium E5300 Processor 2.60 GHz, 2M L2 cache, 800 MHz FSB	X	X	X
Intel Pentium E5400 Processor 2.70 GHz, 2M L2 cache, 800 MHz FSB	X	X	X
Intel Pentium E5700 Processor 3.00 GHz, 2M L2 cache, 800 MHz FSB	X	X	X
Intel Pentium E6300 Processor 2.80 GHz, 2M L2 cache, 1066 MHz FSB	X	X	X
Intel Pentium E6500 Processor 2.93 GHz, 2M L2 cache, 1066 MHz FSB	X	X	X
Intel Pentium E6800 Processor 3.33 GHz, 2M L2 cache, 1066 MHz FSB	X	X	X
Intel Core 2 Duo Processors:			
Intel Core 2 Duo E7500 Processor 2.93 GHz, 3M L2 cache, 1066 MHz FSB	X	X	X
Intel Core 2 Duo E7600 Processor 3.06 GHz, 3M L2 cache, 1066 MHz FSB	X	X	X
Intel Core 2 Duo E8400 Processor 3.0 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology	X	X	X
Intel Core 2 Duo E8500 Processor 3.16 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology	X	X	X
Intel Core 2 Duo E8600 Processor 3.33 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology	X	X	X
Intel Core 2 Quad Processors:			

Standard Features and Configurable Components (availability may vary by country)

Intel Core 2 Quad Q8400 Processor 2.66 GHz, 4M L2 cache, 1333 MHz FSB		X	X
Intel Core 2 Quad Q8400s Processor (low power) 2.66 GHz, 4M L2 cache, 1333 MHz FSB	X		
Intel Core 2 Quad Q9500 Processor 2.83 GHz, 6M L2 cache, 1333 MHz FSB		X	X
Intel Core 2 Quad Q9505 Processor 2.83 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology		X	X
Intel Core 2 Quad Q9505s Processor (low power) 2.83 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology	X		
Intel Core 2 Quad Q9550 Processor 2.83 GHz, 12M L2 cache, 1333 MHz FSB with vPro Technology		X	X
Intel Core 2 Quad Q9550s Processor (low power) 2.83 GHz, 12M L2 cache, 1333 MHz FSB with vPro Technology	X		
Intel Core 2 Quad Q9650 Processor 3.0 GHz, 12M L2 cache, 1333 MHz FSB with vPro Technology		X	X

Intel Core 2 Processor with vPro Technology

All HP Compaq 8000 Elite Series models featuring this technology include processors which are part of the Intel 2010 Stable Image Platform Program (SIPP) designed to ensure the stability promise inherent in the value proposition of the HP Compaq 8000 Elite Series Business PC, thus making these models the most stable, secure, and manageable platforms available to enterprises today

The 2010 SIPP processors are:

- Core 2 Duo E8400, E8500, E8600
- Core 2 Quad Q9505, Q9505s, Q9550, Q9550s, Q9650

Intel's Core 2 Processor with vPro Technology suite of features includes:

Intel Advanced Management Technology (AMT) v5.0 – An advanced set of remote management features and functionality which provides network administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 5.0 includes all features described as part of Intel Standard Manageability plus the following advanced management functions:

- Fast Call for Help – a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection
- Remote Scheduled Maintenance – pre-schedule when the PC connects to the IT or service provider console for maintenance. Remote PCs can get required patches, be inventoried, etc by connecting to their IT console or Service Provider when it's convenient
- Remote Alerts – automatically alert IT or service provider if issues arise
- Access Monitor – Provides oversight into Intel® AMT actions to support security requirements

Microsoft NAP Support – Allows AMT 5.0 to gain access to a Microsoft NAP enabled 802.1x network OOB to enable OOB SW updates, inventories, remote diagnostics, etc. NAP is a new platform and solution that controls access to network resources based on a client computer's identity and compliance with corporate governance policy. NAP allows network administrators to define granular levels of network access based on who a client is, the groups to which the client belongs, and the degree to which that client is compliant with corporate governance policy. If a client is not compliant, NAP provides a mechanism to automatically bring the client back into compliance and then dynamically increase its level of network access.

When a client attempts to access the network or communicate on the network, it must present its system health state or proof of health compliance. If a client cannot prove it is compliant with system health requirements (for example, that it has the latest operating system and antivirus updates installed), its access to the network or communication on the network can be limited to a restricted network containing server resources so that health compliance issues can be remedied. After the updates are installed, the client requests access to the network or attempts the communication again. If compliant, the client is granted unlimited access to the network or the communication is allowed.

Redundant Array of Independent Drives (RAID)

Flexible implementation:

- DriveLock is supported while in RAID mode. Users can manage the DriveLock password from within F10 Setup. Locked drives will be displayed as such in the RAID option ROM interface.
- Hard drive information can be viewed within F10 Setup while in RAID mode. Previously, the hard drives will not appear in Drive Configuration when switching to RAID mode.
- DPS Self Test can be executed on physical hard drives while in RAID mode.
- The RAID Setup Utility (accessed through CTRL-I) can be protected by the F10 Setup password.

NOTE:
RAID 1 is the only RAID configuration offered via factory configurations. The pre-configured systems:

- Are only available on the CMT and SFF form factors. The USDT does not support RAID as it does not allow for more than one hard disk drive.
- Are complete RAID systems and have both drives installed. If the CMT is configured with three hard disk drives, the third drive is would be unpartitioned and not part of the RAID array
- Have the necessary Option ROM configuration.
- Are pre-loaded and pre-installed with all required Intel software.
- Include a preinstalled operating system that is mirrored mode out of the box.

Please refer to the HP White Paper titled "Advanced Host Controller Interface (AHCI) and Redundant Array of Independent Disks (RAID) on HP Compaq 8000 Elite Series PCs" at: http://www.hp.com for more information and instructions.

DDR3 Synchronous DRAM NON-ECC System Memory

Memory upgrades are accomplished by adding single or multiple DIMMs of the same or varied sizes. This chart does not represent all possible memory configurations. The HP Compaq 8000 Elite Series PC supports non-ECC DDR3 PC3-10600 (1333 MHz) and PC3-8500 (1066 MHz) memory.

CAUTION: You must shut down the computer and disconnect the power cord before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged in to an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

Memory Configurations: Ultra Slim Desktop

Maximum Memory*	Supports up to 8 GB of DDR3 SDRAM using SO-DIMM modules. Slot 1 is black and must always be populated. Not all memory configurations possible are represented below. NOTE: For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements.

Total Memory	Slot	
	Channel A (black)	Channel B (white)
1 GB	1 GB	
2 GB (dual channel symmetric)	1 GB	1 GB
4 GB (dual channel symmetric)	2 GB	2 GB
8 GB (dual channel symmetric)	4 GB	4 GB

* The Intel Q45 Express chipset includes a built-in Management Engine (ME), which allocates memory for manageability functions. Management Engine memory is shared with system memory. If the PC contains a single SO-DIMM, 16 MB of memory is pre-allocated for it at system startup. If the PC contains two SO-DIMMs, 32 MB of memory is pre-allocated. This memory is not made available to the operating system, just as pre-allocated video memory is not available.

Memory Configurations: Small Form Factor and Convertible Minitower

Maximum Memory*

Supports up to 16 GB of DDR3 SDRAM using DIMM modules. Slot 1 is black and must always be populated. Not all memory configurations possible are represented below.

NOTE:
For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system.

NOTE:

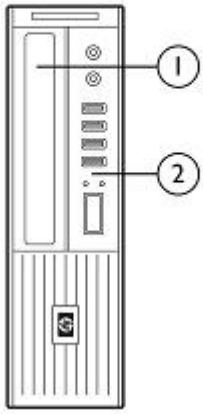
The Q45 chipset Graphics Memory Controller Hub (GMCH) supports DDR3 memory technology up to a maximum of 1066 MHz. Therefore, systems configured with PC3-10600 (1333 MHz) memory DIMMs will operate at 1066 MHz.

Total Memory	Slot			
	Channel A		Channel B	
	1 (black)	2 (white)	3 (white)	4 (white)
1 GB	1 GB			
2 GB (dual channel symmetric)	1 GB		1 GB	
4 GB (dual channel symmetric)	1 GB	1 GB	1 GB	1 GB
8 GB (dual channel symmetric)	2 GB	2 GB	2 GB	2 GB
16 GB (dual channel symmetric)	4 GB	4 GB	4 GB	4 GB

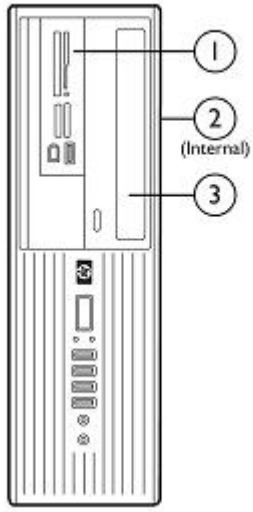
NOTE: The Intel Q45 Express chipset includes a built-in Management Engine (ME), which allocates memory for manageability functions. Management Engine memory is shared with system memory. If the PC contains a single SO-DIMM, 16 MB of memory is pre-allocated for it at system startup. If the PC contains two SO-DIMMs, 32 MB of memory is pre-allocated. This memory is not made available to the operating system, just as pre-allocated video memory is not available.

Standard Features and Configurable Components (availability may vary by country)

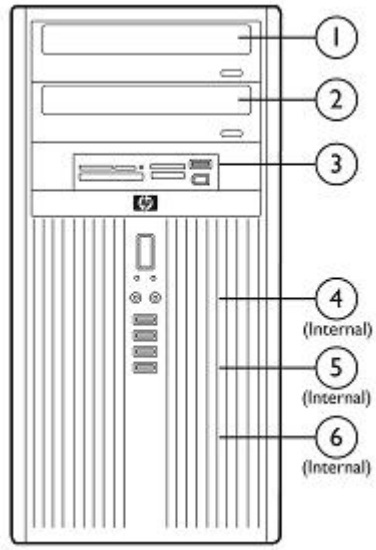
Ultra-slim Desktop



Small Form Factor



Convertible Minitower



Storage - Drive Support									
	Ultra Slim Desktop			Small Form Factor			Convertible Minitower		
	SDR	ODD	HDD	MCR	ODD	HDD	MCR	ODD	HDD
Quantity Supported	1	1	1	1	1	2	1	2	3
Position	1	2	3	1	3	2,1	3	1,2	4,5,6

Data Storage Drives	USDT	SFF	CMT
160-GB Hard Disk Drives			
160GB 2.5" Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV	X		
160GB 3.5" Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
160GB 2.5" Hard Disk Drive 10,000 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart III		X	X
160GB Removable Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
250-GB Hard Disk Drives			
250GB 2.5" Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV	X		
250GB 3.5" Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
250GB Removable Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV		X	X

Standard Features and Configurable Components (availability may vary by country)

320-GB Hard Disk Drives			
320GB 3.5" Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
320-GB 2.5" Self Encrypting Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV	X	X	X
320GB Removable Hard Disk Drive 7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
500-GB Hard Disk Drives			
500GB 3.5" Hard Disk Drive 7,200 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
500GB Removable Hard Disk Drive 7,200 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
1-TB Hard Disk Drives			
1 TB 3.5" Hard Disk Drive 7,200 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart IV		X	X
Solid State Drives			
64GB 2.5" Solid State Drive	X	X	X
80-GB 2.5" Solid State Drive	X	X	X
Optical Disc Drives			
DVD-ROM Drive[1]		X	X
Slimline DVD-ROM Drive[1]	X		
SuperMulti LightScribe DVD Writer Drive[1,2,3]		X	X
Slimline SuperMulti LightScribe DVD Writer Drive[1,2,3]	X		
Blu-Ray Writer Drive		X	X
Media Card Readers			
Media Card Reader (22-in-1)		X	X
Media Card Reader (22-in-1) with 1394 port		X	X
Secure Digital (SD) HC Reader	X		

[1]For playing DVDs, Corel WinDVD 8
[2]For writing CDs, choice of Sonic/Roxio Easy Media Creator 9 orRoxio Business Creator 10
[3]For writing CDs and DVDs, video editing and authoring DVDs, choice of Sonic/Roxio Easy Media Creator 9 or Roxio Business Creator 10

Standard Features and Configurable Components (availability may vary by country)

Security Solutions and Capabilities	USDT	SFF	CMT
Trusted Platform Module (TPM) 1.2[1]	X	X	X
Stringent Security (via BIOS)[2]	X	X	X
SATA Port Disablement (via BIOS)	X	X	X
Drive Lock	X	X	X
RAID Configurations		X	X
HP ProtectTools Embedded Security Software	X	X	X
Serial, Parallel, USB enable/disable (via BIOS)	X	X	X
Optional USB Port Disable at factory (user configurable via BIOS)	X	X	X
Removable Media Write/Boot Control	X	X	X
Power-On Password (via BIOS)	X	X	X
Setup Password (via BIOS)	X	X	X
Solenoid Hood Lock / Sensor		X	X
Hood Sensor	X		
Support for chassis padlocks and cable lock devices	X	X	X

[1]TPM module disabled where use is restricted by law; for example, Russia.
[2]This setting is defaulted to disable, but when enabled, the PW jumper will not clear the BIOS pre-boot authentication passwords.

Network Interface Connection	USDT	SFF	CMT
Intel 82567LM GbE Network Connection (integrated)	X	X	X
Intel Gigabit CT Desktop NIC Card		X	X
Broadcom NetXtreme GbE Ethernet Plus NIC (PCIe x1)		X	X
HP 802.11 b/g/n Wireless NIC (PCIe x1)		X	X
Intel Wi-Fi Link 5100 a/b/g/n Wireless NIC (mini PCI)	X		

NOTE: These wireless network interface solutions will disable the vPro Technology features.

Modem	USDT	SFF	CMT
LSI Hi-Speed 56K International Soft Modem (PCIe x1)		X	X

Graphics	USDT	SFF	CMT
Intel Graphics Media Accelerator 4500 (integrated)	X	X	X
Nvidia GeForce 310 DP PCIe x16 Graphics Card		X	X
Nvidia Quadro NVS 290 Graphics Card		X	X
Nvidia Quadro NVS 295 Graphics Card		X	X
ATI Radeon HD 4550 Graphics Card*		X	X
ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card		X	X
HP ADD2 SDVO + DVI-D Video Adapter		X	X

Standard Features and Configurable Components (availability may vary by country)

HP DisplayPort to DVI-D Adapter	X	X	X
HP DisplayPort to VGA Adapter	X	X	X
HP DisplayPort to HDMI Adapter	X	X	X
HP DisplayPort Cable	X	X	X

* When ordered with an Nvidia Quadro NVS 295 card, the PC is shipped with two DisplayPort to VGA Adapters. When an Nvidia Quadro NVS 295 card is purchased as an after-market option, it comes with two DisplayPort to DVI-D Adapters.

Multi-Media	USDT	SFF	CMT
High Definition Audio with Realtek ALC261 codec (all ports are stereo)	X	X	X
Microphone/Headphone* and dedicated headphone front ports	X	X	X
Line-out and Line-In rear Ports*	X	X	X
Multi-streaming capable*	X	X	X
Internal Speaker (standard)	X	X	X
HP Thin USB Powered Speakers(optional)	X	X	X
HP TV Tuner Mini PCIe Card	X		
HP TV Tuner PCIe x1 Card		X	X

* The front microphone port is re-taskable as a Line-in, Microphone-in or Headphone . Rear audio input ports are re-taskable as Line-in or Microphone-in. External speakers must be powered externally. Multistreaming can be enabled in the Realtek control panel to allow independent audio streams to be sent to/from the front and rear jacks. This allows for different audio applications to use separate audio ports on the system. For example, the front jacks could be used with a headset for a communications application while the rear jacks are being used with external speakers and a multimedia application.

Input Devices	USDT	SFF	CMT
PS/2 Standard Keyboard	X	X	X
USB Standard Keyboard	X	X	X
USB CCID SmartCard Keyboard	X	X	X
USB Mini Keyboard	X	X	X
USB and PS/2 Washable Keyboard	X	X	X

PS/2 Optical Scroll Mouse	X	X	X
USB Optical Scroll Mouse	X	X	X
USB Laser Scroll Mouse	X	X	X
USB and PS/2 Washable Mouse	X	X	X

Miscellaneous	USDT	SFF	CMT
FireWire (IEEE 1394) Card		X	X
Serial Port Adapter (RS-232 compatible)		X	X
Parallel Port Adapter		X	X
eSATA Port Adapter		X	X
PC Tower Stand	X	X	

Configure CMT in desktop orientation		X
Rear Port/Cable Control Cover	X	

After-Market Options (availability may vary by region)

Communications Devices	USDT	SFF	CMT	Part Number
HP Wireless 802.11 b/g/n NIC Card		X	X	FH971AA
Broadcom NetXtreme GbE Ethernet Plus NIC Card		X	X	FS215AA
Intel Gigabit CT Desktop NIC Card		X	X	FH969AA
LSI Hi-Speed 56K Int'l Soft Modem Card		X	X	FH970AA
RJ11 Modem Adapter Kit		X	X	DC131C

Note:
The use of a NIC Card (wired or wireless) will disable the vPro Technology features.

Graphics Solutions	USDT	SFF	CMT	Part Number
ATI Radeon HD 4550 Graphics Card		X	X	AT042AA
ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card			X	VN566AA
Nvidia Quadro NVS 290 PCIe x16 Graphics Card		X	X	KG748AA
Nvidia Quadro NVS 290 PCIe x1 Graphics Card		X		KN586AA
Nvidia Quadro NVS 295 Graphics Card		X	X	FY943AA
Nvidia GeForce 310 DP PCIe x16 Graphics Card		X	X	VG885AA
HP ADD2 SDVO + DVI-D Video Adapter		X	X	DY674A
DMS59 DVI Dual-head Connector Cable		X	X	DL139A
HP DVI to DVI cable		X	X	DC198A
HP DisplayPort To DVI-D adapter	X	X	X	FH973AA
HP DisplayPort To DL DVI-D adapter	X	X	X	NR078AA
HP DisplayPort to VGA Adapter	X	X	X	AS615AA
HP DisplayPort Cable Kit	X	X	X	VN567AA

Hard Disk Storage Drives	USDT	SFF	CMT	Part Number
HP 160GB SATA NCQ SMART IV Hard Disk Drive		X	X	PY277AT
HP 250GB SATA NCQ SMART IV Hard Disk Drive		X	X	PY278AA
HP 320GB SATA NCQ SMART IV Hard Disk Drive		X	X	FH963AA
HP 500GB SATA NCQ SMART IV Hard Disk Drive		X	X	KW347AA
HP 64-GB Solid State Drive	X	X	X	VG679AA
HP 80-GB Solid State Drive	X	X	X	BM848AA
HP eSATA Adapter		X	X	FH966AA
HP Removable SATA Hard Drive Enclosure (frame & carrier)		X	X	RY102AA
HP Removable SATA Hard Drive Enclosure (Carrier Only)		X	X	RY103AA

After-Market Options (availability may vary by region)

Input Devices	USDT	SFF	CMT	Part Number
HP PS/2 Standard Keyboard	X	X	X	DT527A
HP USB Standard Keyboard	X	X	X	DT528A
HP USB Mini Keyboard	X	X	X	AS601AA
HP USB Gray Keyboard	X	X	X	DT529A
HP USB SmartCard Keyboard	X	X	X	ED707AA
HP USB Keyboard and Mouse Kit	X	X	X	RC465AA
HP USB Washable Keyboard	X	X	X	VF097AA
HP USB and PS/2 Washable Mouse	X	X	X	BM866AA
HP USB and PS/2 Washable Keyboard and Mouse Kit	X	X	X	BU207AA
HP PS/2 Optical Scroll Mouse	X	X	X	EY703AA
HP USB Optical Scroll Mouse	X	X	X	DC172AT
HP USB Laser Mouse	X	X	X	GW405AT
HP USB Travel Mouse	X	X	X	RH304AA
HP 2.4GHz Wireless Keyboard and Mouse	X	X	X	NB896AA

System Memory	USDT	SFF	CMT	Part Number
1 GB DIMM		X	X	AT023AA
2 GB DIMM		X	X	AT024AA
4 GB DIMM		X	X	VH638AA
1 GB SO-DIMM	X			VH639AA
2 GB SO-DIMM	X			VH640AT
4 GB SO-DIMM	X			VH641AT

Multimedia Devices	USDT	SFF	CMT	Part Number
HP Thin USB Powered Speakers	X	X	X	KK912AA
DVD-ROM Drive		X	X	AR629AA
SuperMulti LightScribe Drive		X	X	AR630AA
Blu-Ray Writer Drive		X	X	AR482AA
DVD-ROM Drive (Slimline	X			VP033AA
SuperMulti LightScribe Drive (Slimline)	X			VP034AA

After-Market Options (availability may vary by region)

Removable Media Storage	USDT	SFF	CMT	Part Number
HP USB External Diskette Drive	X	X	X	DC141B
HP Media Card Reader (22-in-1)		X	X	AR941AA
HP Media Card Reader (22-in-1) with FireWire (IEEE 1394)		X	X	AR942AA

Security Devices	USDT	SFF	CMT	Part Number
HP/Kensington MicroSaver Cable Lock	X	X	X	PC766A
HP Business PC Security Lock	X	X	X	PV606AA
HP USDT Rear Port Controller Cover	X			VN571AA
HP SFF Solenoid Lock and Hood Sensor		X		BP428AA
HP CMT Solenoid Lock and Hood Sensor			X	DE618A
HP SFF Wall Mount/Security Sleeve		X		VN570AA

HP Client Automation Software	USDT	SFF	CMT	Part Number
HP Client Automation – Standard Edition (single seat)	X	X	X	T3488AA
HP Client Automation – Standard Edition (10 seats)	X	X	X	TA599AA
HP Client Automation – Standard Edition (100 seats)	X	X	X	TA600AA
HP Client Automation – Standard Edition (500 seats)	X	X	X	TA601AA
HP Client Automation – Standard Edition (1,000 seats)	X	X	X	T3489AA

Stands and Accessories	USDT	SFF	CMT	Part Number
HP Integrated Work Center Stand	X			GN783AA
HP USDT Tower Stand	X			VN568AA
HP SFF Tower Stand		X		VN569AA
HP Integrated Work Center – Small Form Factor		X		QK549AA
HP Serial Port Adapter (RS-232 compatible)		X	X	PA716A
HP Parallel Port Adapter		X	X	KD061AA
HP 5.25" Blank Bezel Kit (50 pack)		X	X	DC177B
HP FireWire (IEEE 1394) Card		X	X	PA997A

Weights and Dimensions (configured with 1 HDD and 1 ODD)	Ultra-slim Desktop	Small Form Factor	Convertible Minitower
Chassis (H x W x D)	2.6 x 9.9 x 10 in 66 x 251.5 x 254 mm	3.95 x 13.30 x 14.9 in 100 x 338 x 378.5 mm	17.63 x 7.00 x 17.5 in 447.8 x 177.8 x 444.5 mm
System Volume	257.5 cu in 4.22 L	790.26 cu in 12.95 L	2160 cu in 35.4 L
Tower Stand (H x W x D)	1.07 x 4.92 x 6.69 in 27.2 x 124.9 x 169.9 mm	1.12 x 7.01 x 7.87 in 28.5 x 178 x 200 mm	N/A
Packaging (H x W x D)	8.60 x 15.68 x 19.68 in 218.4 x 398.3 x 499.9 mm	9.00 x 19.68 x 23.38 in 228.6 x 499.9 x 593.85 mm	22.64 x 12.72 x 24.41 in 575.0 x 323 x 620 mm
System Weight	6.75 lb 3.07 kg	16.72 lb 7.6 kg	24.54 lb 11.15 kg
Shipping Weight	14.42 lb 6.54 kg	17.86 lb 8.1 kg	34.0 lb 15.42 kg
Max Supported Weight (desktop orientation)	77 lb 35 kg	77 lb 35 kg	77 lb 35 kg

I/O Ports	Ultra-slim Desktop	Small Form Factor	Convertible Minitower
USB 2.0	Front – four (4) ports Rear – six (6) ports		
Serial	N/A	one RS-232 compatible port standard	
		second port available optionally	
Parallel	N/A	one port available as an option	
eSATA	N/A	one port available as an option	
PS/2	color coded support for keyboard (purple) and mouse (green)		
Video	VGA and DisplayPort provide integrated dual independent monitor support		
DVI output	available via optional DisplayPort to DVI Adapter		
Audio	Front – microphone & headphone Rear – line input (supports microphone or line input), line out Note: See Audio/Visual section for information on re-taskable audio ports		
NIC	Industry standard RJ-45 port accesses the integrated network interface controller		

Slots	Ultra-slim Desktop	Small Form Factor	Convertible Minitower
Type and quantity	(1) mini PCI Express	(1) PCI (2) PCI Express x1 (1) PCI Express x16	(3) PCI (1) PCI Express x1 (half-length) (2) PCI Express x16
Slot specifications		Low profile – 2.5″ Length: 6.6″ 25W maximum	Full height – 4.2″ Primary x16 slot supports 75W or 35W card Secondary x16 slot supports 35W card

			Secondary slot functions electrically as a x4 slot
PCI	N/A	(1)	(3) 25W max. power
PCI Express x16	N/A	(1)	(2) 75W max. power (primary) 35W max. power (secondary)
PCI Express x1	N/A	(2) 10W max. power	(1) 10W max. power
Bays	**Ultra-slim Desktop**	**Small Form Factor**	**Convertible Minitower**
3.5″ external	N/A	1 bay available for Media Card Reader unless used for a secondary hard drive	N/A
5.25″ external	N/A	1 bay – 8.19″ depth	3 bays Top two bays accept drives up to 8.19″ depth Bottom bay accepts drives up to 5.7″ depth
Slimline	1 bay for ODD	N/A	N/A
Secure Digital (SD) Reader	SD Reader or blank	N/A	N/A
Internal Drive Bays	1 bay for 2.5″ drive	1 bay for 3.5″ drive	3 bays for 3.5″ drives
Controller	**Ultra-slim Desktop**	**Small Form Factor**	**Convertible Minitower**
Hard Drive Controller	Serial ATA Supports SATA 1.5-GB/s and 3.0-GB/s		
SATA Interfaces	(1) Total	(4) Total: (3) common SATA (1) eSATA	(5) Total: (4) common SATA (1) eSATA
Host SATA Controller	Advanced Host Controller Interface (AHCI) Revision 1.2. The specification includes a description of the hardware/software interface between system software and the host controller hardware.		

Unit Environment and Operating Conditions	
General Unit Operating Guidelines • Keep the computer away from excessive moisture, direct moisture and the extremes of heat and cold, to ensure that unit is operated within the specified operating range. • Leave a 10.2 cm (4 in) clearance on all vented sides of the computer to permit the required airflow. • Never restrict airflow into the computer by blocking any vents or air intakes. • Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air. • Occasionally clean the air vents on the front, back, and any other vented side of the computer. Lint, dust and other foreign matter can block the vents and limit the airflow. • If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.	
Temperature Range	Operating: 50° to 95° F (10° to 35° C)* Non-operating: –22° to 140° F(–30° to 60° C)
Relative Humidity	Operating: 10% to 90% (non-condensing at ambient) Non-operating: 5% to 95% (non-condensing at ambient)
Maximum Altitude (unpressurized)	Operating: 10,000 ft (3048 m) Non-operating: 30,000 ft (9144 m)
*Operating temperature is de-rated 1.0 deg C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level, no direct sustained sunlight. Maximum rate of change is 10 deg C/Hr. The upper limit may be limited by the type and number of options installed.	

Power Supply	Ultra Slim Desktop	Small Form Factor	Convertible Minitower
Standard Efficiency	N/A	240W active PFC	320W active PFC
High Efficiency*	135W active PFC 87% efficient	240W active PFC 87/89/85% efficient at 20/50/100% load	320W active PFC 87/89/85% efficient at 20/50/100% load
Operating Voltage Range	90 – 264 VAC	90 – 264 VAC	90 – 264 VAC
Rated Voltage Range	100 – 240 VAC	100 – 240 VAC	100 – 240 VAC
Rated Line Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Operating Line Frequency Range	47 – 63 Hz	47 – 63 Hz	47 – 63 Hz
Rated Input Current	N/A	4A	5.5A
Rated Input Current with Energy Efficient* Power Supply	2.4A	4A	5.5A
Current Leakage (NFPA 99)	< 250 µA	< 275 µA	< 450 µA
Power Supply Fan	N/A	92mm variable speed	92mm variable speed
Power Cord Length	N/A	6 ft (1.83 m)	6 ft (1.83 m)
External Power Adapter			
Dimensions	6.7 x 2.6 x 1.5 in	N/A	N/A
Total Cord Length	12 ft 8 in	N/A	N/A
*High efficiency power supply is a requirement for ENERGY STAR qualification in conjunction with a select range of processors and modules			

ROM BIOS Information

Key features of the HP BIOS include:

- Deployment and manageability – HP BIOS provides several technologies that help integrate the HP Elite PC into the enterprise, such as PXE, remote configuration, remote control, and F10 Setup support for 12 languages.
- Select models feature either Intel Standard Manageability or Core 2 processor with vPro Technology.
- Stability – HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- Computrace agent – For tracking and tracing services, available in select countries, separate software and purchase of a subscription is required.
- Thermal and power management – The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Business Desktop computer in any enterprise environment.
- Acoustic performance – Industry leading acoustic emissions across the range of operating conditions.
- Serviceability – HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery – HP BIOS provides numerous ways to upgrade HP Business Desktop computers, including BIOS updates from within DOS (Flashbin), BIOS updates from within Windows (HPQFlash), HP Client Manager, and fail-safe recovery. In addition, the HP Business Desktop BIOS Utilities tool enables replicated BIOS setup throughout the Enterprise; it is available from within the BIOS software and from the support website.

Additional HP BIOS Features

- Power-On password – Helps prevent an unauthorized user from powering on the system.
- Administrator password – Also known as the setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS version cannot be changed and changes cannot be made to BIOS settings using F10 setup or under the OS.
- Advanced Configuration and Power Interface (ACPI) – Represents a significant innovation in power and configuration management, allowing operating systems and applications to manage power based on activity and usage. HP Elite models use ACPI to provide power conservation features.
- S5 Max Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 1W is S5 (when turned off). When S5 Max Power Savings feature is enabled power to slots is turned off along with WOL functionality.

Other Features

- Advanced Configuration and Power Management Interface (ACPI). Allows the system to wake from a low power mode. Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.
- System Management BIOS v2.6
- Intel Wired for Management support; industry wide initiative to make Intel architecture based PCs, servers and mobile computers more inherently manageable out-of-the-box and over the network
- Dual State Power Button; acts as both an on/off button and a suspend-to-sleep button

Serviceability Features

• Dual colored power LED on front of computer to indicate either normal or fault condition
• Diagnostic LED Explanation Table:
  ○ Number of 1-second red LED blinks followed by a 2-second pause, then repeats:
  ▪ 2 – processor thermal protection activated
  ▪ 3 – processor not installed
  ▪ 4 – power supply failure
  ▪ 5 – memory error
  ▪ 6 – video error
  ▪ 7 – PCA failure (ROM detected failure prior to video)
  ▪ 8 – invalid ROM, bootblock recovery mode
  ▪ 9 – system not fetching code
  ▪ 10 – system hang while loading an option ROM
• System/Emergency ROM
• Flash ROM
• CMOS Battery Holder for easy replacement
• Flash Recovery with Video Configuration Record Software
• 5 Aux Power LED on System PCA
• Processor ZIF Socket for easy Upgrade
• Over-Temp Warning on Screen (Requires IM Agents)
• Clear Password Jumper
• DIMM Connectors for easy Upgrade
• Clear CMOS Button
• NIC LEDs (integrated) (Green & Amber)
• Dual Color Power and HD LED – To Indicate Normal Operations and Fault Conditions
• Color coordinated cables and connectors
• Tool-less Hood Removal
• Front power switch
• System memory can be upgraded without removing the system board or any internal components
• Tool-less Hard Drive, CD & Diskette Removal
• Green Pull Tabs, and Quick Release Latches for easy Identification
Note:
thumb screw release mechanism is used with the Ultra-slim Desktop chassis cover.

Additional Features	Description
Intel® Standard Manageability*	• Requires the utilization of the integrated network connection • Available with selected processors not part of the Intel Stable Intel Platform Program (SIPP) • Intel Advanced Management Technology (AMT) v3.2 • Basic PC management capabilities such as asset inventory, HW alerting, SOL/IDE-R, remote configuration, agent presence and system defense. • DASH 1.1 compliance. Support for profile updates. • Host VPN support for local management VPN tunneling
* PCs with Intel Standard Manageability include features of Intel Active Management Technology (Intel AMT). Intel AMT requires the computer system to have an Intel AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. For more information, see http://www.intel.com/technology/platform-technology/intel-amt/.	
Intel Core 2 Processor with vPro Technology	• Requires the utilization of the integrated network connection • Available with selected processors which are part of the Intel Stable Intel Platform

	Program (SIPP) • Intel Advanced Management Technology (AMT) v5.0 • Intel Standard Manageability technologies (see above for a list of features) • Fast Call for Help – client outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection • Audit Logs – policy based log of AMT actions to deter rogue administrator actions • Microsoft NAP Support – allows AMT to gain access to a Microsoft NAP enabled 802.1x network OOB to enable OOB SW updates, inventories, remote diagnostics, etc. • Remote Scheduled Maintenance – Pre-schedule when the PC connects to the IT or service provider console for maintenance • Remote Alerts – automatically alert IT or service provider if issues arise • Access Monitor – Provides oversight to support security requirements
DASH 1.1 support (Desktop and Mobile Architecture for System Hardware)	A standards initiative for representing out-of-band management capability for computer systems. It is a secure, web-services based successor to ASF.
ASF 2.0 support (Alert Standard Format)	Industry-standard specification for network alerting in operating system-absent environments
TXT (Trusted Execution Technology) and VT-d (Virtualized devices)	TXT allows for secure management (via TPM) and measured launch of VMM, as well as teardown of secrets in unexpected reset case. TXT support provided in select Intel processors VT-d is a chipset technology that virtualizes directed I/O Together, TXT and VT-d may be used to support verified launch of a known trusted VMM that also may protect VMs from accessing each other's memory.
Computrace	Computrace agent support standard
Towerable Orientation	Product can be oriented as either a desktop or a tower
Drive Lock	Implementation of the industry standard ATA Security feature set. When enabled, it prevents software access to user data on the drive until one or two user-defined passwords are provided.
Drive Protection System	DPS Access through F10 Setup during Boot
	A diagnostic hard drive self test. It scans critical physical components and every sector of the hard drive for physical faults and then reports any faults to the user
	Running independently of the operating system, it can be accessed through a Windows-based diagnostics utility or through the computer's setup procedure. It produces an evaluation on whether the hard drive is the source of the problem and needs to be replaced.
	The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures.
SMART Technology (Self-Monitoring, Analysis and Reporting Technology)	Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted
SMART I – Drive Failure Prediction	Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count
SMART II – Off-Line Data Collection	By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure
SMART III – Off-Line Read Scanning with Defect Reallocation	IOEDC: I/O Error Detection Circuitry

SMART IV – End-to-End CRC for hard drives	Detects errors in Read/Write buffers on HDD cache RAM
	Interface in F10 setup provides confirmation of SMART IV support.

Technical Specifications - Audio

High Definition Audio

Type	Integrated
HD Stereo Codec	Realtek 4-channel ALC261 codec
Audio I/O Ports	Front microphone-In (150-K ohm Input Impedance Rear Line-In/Microphone input (150-K ohm Input Impedance, function is configurable by audio driver) Rear Line-Out* (190 ohms Output Impedance, expects at least a 10-K ohm load) Front Headphone-Out (0.5 Ohm Output Impedance, expects at least a 32 ohm load) Front Microphone/Headphone jack is re-task able to provide Microphone input, line-in or Headphone output to support connecting two headphones to the front of the system. When configured as a second front headphone output, both front headphone outputs are always driven with the same signal.
Internal Speaker Amplifier	For the internal speaker only. External speakers must be powered externally. Rear Line-in audio port is re-taskable as either Line-in or Microphone-In.
Multistreaming Capable	Multi-streaming can be enabled in the Realtek control panel to allow independent audio streams to be sent to/from the front and rear jacks.
Sampling	8 kHz – 192 kHz
Wavetable Syntheses (software)	Yes – Uses OS soft wavetable
Analog Audio	Yes
# of Channels on Line-Out (mono/stereo)	Stereo (Left & Right channels)
Internal Audio Speaker Power Rating	1.5 W
Internal Speaker	Yes
External Speaker Jack (Line-Out)	Yes

Note:
The audio ports/jacks provided by all of our systems are 3.5mm in diameter. This would include both the front jacks and rear jacks, for audio in/out, mic in and headphone out.

Technical Specifications - Audio

HP Thin USB Powered Speakers

On/Off/Volume Controls	Right side of right speaker	
Power LED	Front of right speaker (green)	
Frequency Response	FO to 20kHz	
Watts	2/3 watt (normal/maximum)	
Dimensions/Speaker (H x W x D)	5.72 x 3.74 x 0.96 in 14.52 x 9.50 x 2.45 cm	
Net Weight	0.68 lbs 0.31 kg	
Color	Black	
Environmental (all conditions non-condensing)	Operating Temperature:	14° to 104° F –10° to 40° C
	Relative Humidity	40% to 90%
Speaker Cable Length	Input Cord:	5.91 ft 1800mm
	L-channel Cord:	3.28 ft 1000mm
	USB Cord:	5.91 ft 1800mm

Intel 82578 GbE Network Connection (integrated)

Connector	RJ-45
Controller	Intel 82578 Gigabit platform LAN Connect Networking Controller
Memory	24 KB FIFO packet buffer memory
Data rates supported	10/100/1000 Mbps
Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3 ab and 802.3u compliant
Bus architecture	GLCI, LCI interface. Intel specific MAC to PHY interface
Data transfer mode	PCIe-like interface for 1000 speed, SMBus interface for lower 10/100 speeds.
Data rates supported	10/100/1000 Mbps
Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3 ab and 802.3u compliant
Data transfer mode	At gigabit GLCI (Intel proprietary 802.3 series-based interface) is for Data, LCI (parallel bus) for MDIO, at 10/100 LCI for both data and MDIO, GLCI is idle.
Hardware certifications	FCC B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
Power requirement	Requires 3.3V & 1.2V. Power consumption 761 Milliwatts
ACBS	Intel Auto Connect Battery Saving feature
Boot ROM support	Yes
Network transfer mode	Full-duplex Half-duplex (not supported for the 1000BASE-T transceiver)
Network transfer rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
Operating temperature	0° to 85° C
Management	WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic.
Alerting	ASF 2.0 support, AMT 3.0 support

Broadcom NetXtreme GbE Ethernet Plus Network Interface Controller

Connector	RJ-45
Controller	Broadcom 5761 PCI-Express LAN Controller
Memory	8 MB NVRAM serial Flash
Data rates supported	10/100/1000 Mbps
Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x
Bus architecture	PCI-Express
Data path width	Single Channel PCI-Express
Data transfer mode	Bus Master DMA
Hardware certifications	FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682)
Power requirement	1.8W @ 3.3V
Boot ROM support	Yes
Network transfer mode	Full-duplex Half-duplex (not available for the 1000BASE-T transceiver)
Network transfer rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
Environmental	Operating temperature 32° to 131°F (0° to 55° C) Operating humidity 131° F (55° C) with 5% to 95% non-condensing humidity
Dimensions	2.75 in x 4.13 in (7 cm x 10.5 cm), low profile compatible
Operating system driver support	Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional
Management capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles

Intel GbE CT Desktop Network Interface Connection

Connector	RJ-45
Controller	Intel 82574L Gigabit Ethernet Controller
Memory	Integrated Dual 48K configurable transmit receive FIFO Buffers
Data rates supported	10/100/1000 Mbps
Compliance	IEEE 802.1P, 802,1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
Bus architecture	PCI-E 1.0a
Data path width	X1, 250 MB/s, Bi-directional interface
Data transfer mode	Bus-master DMA
Hardware certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
Power requirement	Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T
Boot ROM support	Yes
Network transfer rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps (actual rate limited by PCI Bus)
Environmental	Operating temperature 32° to 131°F (0° to 55° C) Operating humidity 85% at 131° F (55° C)
Dimensions	4.75 x 2.25 x 0.8 in (12.1 x 5.7 x 2.0 cm)
Management	WOL, PXE, DMI, WFM 2.0

HP Wireless Network Connection 802.11 b/g/n

Dimensions (L x H)	3.3 x 4.7 in 8.5 x 12 cm
Weight	0.08 lbs 40 g
Controller	Ralink RT2790
System interface	PCIExpress x1
Network standard	802.11 b/g/n
Frequency band	2.400 - 2.497 GHz
Operating temperature	14° to 149°F, operating (-10° to 65°C, operating)
Storage temperature	-40° to 176°F, non-operating (-40° to 80°C, non-operating)
Humidity	10-90% operating 5-95% non-operating
Operating voltage	3.3V +/- 9% 12V +/- 8%

Platform/WLAN Mode	Power Consumption
Maximum Power Consumption	10 Watts
Transmit Only	4 Watts maximum averaged power over 1 second
Transmit Packet or Active Scanning	1000 mA peak current for 100 microseconds or longer

Technical Specifications - Communications

Power consumption	Receive Only Mode or Idle without IEEE PSP mode enabled	3 Watts maximum averaged over 1 second
	Idle, with IEEE PSP mode enabled	1.0 Watts maximum averaged over 1 second
	Transmit Disabled (turned off in software)	50 mW maximum, averaged over 1 second
	Platform in S3 or S4 (power removed from Low Profile PCI Express Card)	5 mW maximum, averaged over 1 second
Output power (approximately)	802.11b mode	+19 dBm +/- 1.0 dB maximum
	802.11g mode	+17 dBm +/- 1.0 dB maximum
	EWC mode	+17 dBm +/- 1.0 dB maximum (total power in all transmit chains)

	Mode	Data rate	Sensitivity
Receive sensitivity	802.11b	1 Mbps	-94 dBm
	802.11b	11 Mbps	-85 dBm
	802.11g	6 Mbps	-91 dBm
	802.11g	18 Mbps	-85 dBm
	802.11g	48 Mbps	-75 dBm
	802.11g	54 Mbps	-72 dBm
	EWC (2.4 GHz)	6.5 Mbps	-87 dBm
	EWC (2.4 GHz)	54 Mbps	-82 dBm
	EWC (2.4 GHz)	81 Mbps	-78 dBm
	EWC (2.4 GHz)	162 Mbps	-74 dBm
	EWC (2.4 GHz)	270 Mbps	-68 dBm
	EWC (2.4 GHz)	300 Mbps	-64 dBm

	Data Rate (MCS)	Minimum Throughput
Data transfer rate	1 Mbps (802.11 b)	700 kbps
	2 Mbps (802.11 b)	1.4 Mbps
	5.5 Mbps (802.11 b)	3.5 Mbps
	11 Mbps (802.11 b)	5.9 Mbps
	12 Mbps (802.11 g)	6 Mbps
	18 Mbps (802.11 g)	9 Mbps
	24 Mbps (802.11 g)	12 Mbps
	36 Mbps (802.11 g)	18 Mbps
	48 Mbps (802.11 g)	21 Mbps
	54 Mbps (802.11 g)	22.5 Mbps
	6.5 Mbps (20 MHz EWC)	4.5 Mbps
	13 Mbps (20 MHz EWC)	9 Mbps
	19.5 Mbps (20 MHz EWC)	13.5 Mbps
	26 Mbps (20 MHz EWC)	18 Mbps
	39 Mbps (20 MHz EWC)	27 Mbps

	52 Mbps (20 MHz EWC)	36 Mbps
	58.5 Mbps (20 MHz EWC)	40 Mbps
	65 Mbps (20 MHz EWC)	45 Mbps
	78 Mbps (20 MHz EWC)	54 Mbps
	104 Mbps (20 MHz EWC)	72 Mbps
	117 Mbps (20 MHz EWC)	81 Mbps
	130 Mbps (20 MHz EWC)	91 Mbps
	13.5 Mbps (40 MHz EWC)	8 Mbps
	27 Mbps (40 MHz EWC)	16 Mbps
	40.5 Mbps (40 MHz EWC)	24 Mbps
	54 Mbps (40 MHz EWC)	32 Mbps
	81 Mbps (40 MHz EWC)	48 Mbps
	108 Mbps (40 MHz EWC)	64 Mbps
	121.5 Mbps (40 MHz EWC)	72 Mbps
	135 Mbps (40 MHz EWC)	81 Mbps
	IEEE and WiFi compliant 64 / 128 bit WEP encryption	
	AES: CCM	
	802.1x authentication	
Security	WPA: 802.1x. WPA-PSK and TKIP	
	WPA2 certification	
	IEEE 802.11i	
	Cisco Certified Extensions, all versions through V5	
Antenna	HP part number 497792-001	
Certifications	Wi-Fi certified	
Certifications for use by country	United States, Canada, Peru, Taiwan	

Intel WiFi Link 5100 a/b/g/n Wireless Network Interface Connection (USDT)

	IEEE 802.11a
	IEEE 802.11b
	IEEE 802.11g
	IEEE 802.11n
Wireless LAN Standards	Note: The specifications for 802.11n draft 2.0 are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11n WLAN devices. In countries where n draft 2.0 is not allowed, this capability is not enabled.
	Wi-Fi certified (802.11a/b/g only)
Interoperability	Cisco Compatible Extensions Program compliant (802.11a/b/g only) with Microsoft Windows Vista and XP
	Tested with wireless access points from several major manufacturers
Frequency Band	2.4 GHz and 5 GHz
Antenna Structure	1 transmit; 2 receive (1x2)

Technical Specifications - Communications

Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n (draft): 66 possible data rates, ranging from 6 Mbps to 300 Mbps, depending on the combination of Bandwidth, Modulation Coding Scheme, and Guard Interval used, as defined in IEEE 802.11n (draft) specification	
Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM	
Security	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES (support for key sizes of 128, 192, and 256 bits), 802.1x authentication types EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, LEAP, EAP-FAST Support for Cisco Security Features (proven compatibility with Cisco Aironet infrastructure products through the Cisco Compatible Extensions Program Version 4) with Microsoft Windows Vista and XP only.	
Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.	
Media Access Protocol	CSMA/CA (Collision Avoidance) with ACK	
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)	
Roaming	IEEE 802.11 compliant roaming between access points	
Output Power (for CCK)	15 dBm	
Output Power (for OFDM; power varies by data rate)	15 dBm	
Power Consumption	Transmit: 2.3 Watts (average, with one spatial streams) Receive: 1.9 Watts (average with two receive chains Idle mode: 30 mW (average) Radio off: 20 mW (max)	
Power Management	ACPI compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[4]	300 Mbps: -68 dBm, 54 Mbps: -74 dBm, 6 Mbps: -90 dBm	
Antenna Connections	3 U.FL type connectors, 50 ohm nominal impedance	
Range	802.11 a - Typical (@6 Mbps)	600 feet - Outdoor Open Area 150 feet - Indoor, Office environment
	802.11 b - Typical (@1 Mbps)	1200 feet - Outdoor Open Area 300 feet - Indoor, Office environment
	802.11 g - Typical (@1 Mbps)	1200 feet - Outdoor Open Area 300 feet - Indoor, Office environment
Form Factor	PCI-Express MiniCard	
Weight	0.013 lb (6 g)	
Dimensions	0.19 x 1.2 x 2.0 in (4.75 x 29.85 x 50.8 mm)	
Operating Voltage	3.3V +/- 9%, 1.5V +/- 5%	
Temperature	Operating: 32° to 176° F (0° to 80° C) Non-operating: -40° to 176° F (-40° to 80° C)	
Humidity	Operating: 10% to 90% (non-condensing) Non-operating: 5% to 90% (non-condensing)	

Altitude	Operating: 0 to 10,000 ft (3,048 m) Non-operating: 0 to 50,000 ft (15,240 m)	
	Microsoft Windows XP	Microsoft Windows Vista
Configuration Utility[5]	• Microsoft Windows XP Wireless Network Connection Manager • Intel PROSet for Microsoft Windows XP (required for Cisco Compatible Extensions support)	• Microsoft Windows Vista Wireless Network Connection Manager. • Intel IHV extensions for Windows Vista available to support Cisco Compatible Extensions.

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. In Power Save Polling mode and on battery power.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).
5. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.

LSI 56K International SoftModem PCI Express x1 Card

Data Transmission	Technology speeds: 56,000 Kbps maximum downstream data, controllerless Note: 56 Kbps technology refers to download speeds only and requires compatible modems at server sites. Other conditions may limit modem speed. FCC limitations allow a maximum of 53 Kbps during download transmissions.
Data Speeds	(Upload only) 33,600/31,200/28,800/26,400/21,600/19,200/ 16,800/14,400/12,000/9,600/7,200/4,800/2,400/1,200/300
Data Standards	ITU-T V.90, ITU-T, ITU-T V.34, V.44, V.42, V.42bis21, V.32bis, Bell 212A, and Bell 103
Fax Speeds	14,400/12,000/9,600/7,200/4,800/2,400/1,200/300 b/
Fax Mode Capabilities	ITU-T T.31 class 1 FAX, V. 17, V.29, V.27ter, and V.21 Channel 2
Error Correction and Data Compression	V.44, 42bis, V.42 and MNP2-5
Power Management	PCI Bus Power Management Interface Specification (PCI-PM) Revision 1.2, Appendix A. D0, D3hot, and D3cold. Wake on Ring state when in D3cold. If the power management event (PME) feature is enabled in D3cold, a modem can wake the system via WAKE# (WAKEN) or beacon. Meets PCI Express 1.1 standard.
Upgradeability	Driver upgradeable for future enhancements
Video	ITU-T V.80 video ready interface
Other	TIA/EIA 602 standard AT command set Integrated DTE interface with speeds of up to 115.2 Kbps, parallel 16550a UART-compatible interface Optional ring wakeup signal
Operating Temperature	32° to 158° F (0° to 70° C)
Operating Humidity	20% to 90%, non-condensing
Power	Requires a 3.3-V auxiliary power rail on PCI express bus Uses only one PCI express load (i.e., one grant/request pair), one shared IRQ, one electrical load
Chipset	LSI SV92EX - Integrated PCI interface with 3.3-V tolerant buffers and CardBus support

Technical Specifications - Communications

Dimensions (L X H)	Complies with PCI express low profile specifications-6.7 x 2.3 in (17.0 x 5.8 cm) and supports high- and low-profile brackets
Connection	Single RJ-11 connector
Other Features	Digital line protection, call progress monitoring via on-board piezo device, support for high profile and low profile brackets, PnP ID support
Safety	UL recognized to UL 1950, 3rd edition (U.S. and Canada); IEC 950 (TUV, NEMKO, DEMKO, SEMKO); CE Mark, EC 950 (TUV, NEMKO, DEMKO, SEMKO, CE mark
EMC	FCC Part 15, IC ES003, EN 55022, 3rd edition, EN 55024, annex A, EN 61000-4-6, EN 61000-4-8
Telecom	FCC Part 68, IC-CS-03 (Canada); Worldwide PTT approvals Not available in Korea or the Republic of South Africa.
Other	The SV92EX device is packaged in a 32-pin micro leadless chip carrier (MLCC). The SV92EX is fully compliant with the PCI Express revision 1.1 specification. WHQL approved; ASPM compliant.

Intel Graphics Media Accelerator (GMA) 4500

3D/2D Controller	Microsoft DirectX® 10 based with support for Pixel Shader 3.0
VGA Controller	Integrated
DisplayPort	Integrated, Multimode capable; supports HDCP
Bus Type	PCI Express™ x16
RAMDAC	Integrated, 350 MHz
Memory	Graphics memory is shared with system memory. Graphics memory usage varies depending on the amount of system memory installed, BIOS settings, operating system, and system load. 32 MB is pre-allocated for graphics use at system boot time. Additional memory can be allocated at boot time by the BIOS for PAVP (Protected Audio Video Playback) support for playback of protected video content. For Vista, use of PAVP heavy mode preallocates an additional 96MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (DVMT), to provide an optimal balance between graphics and system memory use.

Windows XP Memory Usage

Total System Memory	Pre-Allocated (MB)	DVMT (MB)
.5GB	32	128
1.0GB	32	512
1.5GB	32	768
2.0GB & more	32	1024

Assumes Management Engine, VT-d enabled and other memory allocated for other BIOS usage

Windows Vista Memory Usage

System Memory	PVAP	Avail System Memory (MB)	Total Avail GFX Memory (MB)	Dedicated Video Memory (MB)	System Video Memory (MB)	Shared System Memory (MB)
1 GB	Lite	952	252	32	96	124
	Heavy	856	294	122	6	166
2 GB	Lite	1976	764	32	96	636
	Heavy	1880	806	122	6	678
4 GB	Lite	4024	1759	32	96	1631
	Heavy	3928	1759	122	6	1631
6 GB	Lite	6072	1759	32	96	1631
	Heavy	5976	1759	122	6	1631
8 GB	Lite	8120	1759	32	96	1631
	Heavy	8024	1759	122	6	1631

HW Video Decode	Hardware Accelerated decode for MPEG2 encrypted video; support for PAVP Lite (default) and Heavy (or Paranoid) modes
Maximum Color Depth	32 bits/pixel
Maximum Vertical Refresh Rate	85 Hz at up to 1920x1440, 75 Hz at 2048x1536. Varies with mode and configuration. See table below.
Multi-display Support	Integrated dual independent monitor support facilitated via one VGA port and one DisplayPort integrated on the back plane of the system board and presented as part of the rear I/O set of interfaces. DVI supported via optional HP DisplayPort to DVI-D adapter.
Graphics/Video API Support	Microsoft DirectX® 10, OpenGL® 1.5 (OpenGL® 2.0 available in a driver update)

Maximum Refresh Rate (Hz)

Technical Specifications - Graphics

Resolutions Supported

Resolution	Analog Connection	Digital Connection
640x480	85	60
800x600	85	60
1024x768	85	60
1280x720	85	60
1280x1024	85	60
1440x900	75	60
1600x1200	85	60
1680x1050	75	60
1920x1080	85	60-R
1920x1200	85	60-R
1920x1440	85	N/A
2048x1536	75	N/A
2560x1600	N/A	60*

* Only supported when using a DisplayPort connection

Note:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Note:
60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

NVIDIA Quadro NVS 290 Graphics Card

Bus Type	PCI Express x16; low profile	PCI Express x1, low profile
Memory	256 MB 400MHz DDR2 SDRAM unified frame buffer, Z-buffer and Texture storage	
Connector	Single high-density DMS-59 Flex Connector	
Dimensions	Low-profile, 2.586 x 6.6 in (6.57 x 16.76 cm)	
Multi-Monitor support	Dual monitor support	
RAMDAC	Integrated dual 400MHz	
Maximum Pixel Clock	350-MHz	
Overlay planes	One 16-bit video overlay plane	One 1-bit video overlay plan
High Definition Video Processor (HDVP)	Full screen, full frame video playback of HDTV and DVD content DVD ready motion compensation for MPEG-2 Independent hardware color controls for video overlay Hardware color space conversion (YUV 4:2:2 and 4:2:0) IDCT motion compensation 5-tap horizontal by 3-tap vertical filtering 8:1 up/down scaling	

	Specification	Description
Board Configuration	Description	G86-825
	Core Clock	460-MHz
	Memory Clock	400-MHz
	Frame Buffer	256-MB DDR2, 64-bit wide

Technical Specifications - Graphics

Display resolution support	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays or dual digital displays at 1920x1200 (single-link). NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft Windows
Color planes	32-bit color buffer
DVI support	DMS-59 (to dual DVI-SL)
Supported graphics APIs	OGL 2.1 & DX10 Support; Shader Model 4.0

Resolutions Supported

	Maximum Refresh Rate	
Resolution	Analog Connection	Digital Connection
640x480	85	60
800x600	85	60
1024x768	85	60
1280x720	85	60
1280x1024	85	60
1440x900	75	60
1600x1200	85	60
1680x1050	75	60
1920x1080	85	60-R
1920x1200	85	60-R
1920x1440	85	N/A
2048x1536	75	N/A
2560x1600	N/A	N/A

Note:
Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP

Note:
60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

Technical Specifications - Graphics

NVIDIA Quadro NVS 295 Graphics Card

Form Factor	2.731 inches (H) × 6.600 inches (L), Half-Height
Graphics Controller	NVIDIA Quadro NVS 295 Graphics Board
Bus Type	PCI Express x16, Generation 2.0
Memory	256 MB GDDR3 SDRAM unified graphics memory
Connectors	2 DisplayPort Comes with 2 DisplayPort to VGA Adapters Note: When purchased as an after-market option, this comes instead with 2 DisplayPort to DVI-D adapters.
Maximum Resolution	Two DisplayPort outputs drive two digital displays up to 2560 x 1600
Display Output	Drives DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking Drives DVI enabled digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking (through DisplayPort to DVI-D (single link) cable)
Supported Graphics APIs	OpenGL 3.0 DirectX 10.0

NVIDIA GeForce 310 Graphics Card

Bus type	PCI Express (x16 lanes)	
Board display options	Supports two displays via the DisplayPort and DVI connectors	
	Specification	Description
Board configuration	Graphics Chip	RV620
	Core clock	750 MHz
	Memory clock	500 MHz
	Frame buffer	512 MB DDR3, 64 bit wide
Audio Support (through HDMI only)	Integrated HD Audio codec supports linear PCM and Dolby® Digital (7.1) audio formats for HDMI output	
Core power	22 W (max)	
Dimensions (H x D)	2.71 in x 6.60 in 68.90 mm x 167.65 mm	
Weight	0.30 lb (134.3 g)	
Maximum vertical refresh rate	85 Hz	
Display support	Integrated 400 MHz RAMDAC	
Display max resolution	2560 x 1600 digital, 2048 x 1536 analog	

Technical Specifications - Graphics

Supported Resolutions

Resolution	Maximum Refresh Rate (Hz)	
	Analog Connection	Digital Connectio
640x480	85	60
800x600	85	60
1024x768	85	60
1280x720	85	60
1280x1024	85	60
1440x900	75	60
1600x1200	85	60
1680x1050	75	60
1920x1080	85	60-R
1920x1200	85	60-R
1920x1440	85	N/A
2048x1536	75	N/A
2560x1600	N/A	60*

* Only supported when using a dual-link DVI or DP connection.
Note:
Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP
Note:
60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

Option Kit Contents

NVIDIA GeForce 310 DP PCIe x16 Graphics Cardwith full height bracket attached
DVI to VGA Adapter
Software CD with graphics drivers
Low profile bracket to convert the card for use in a low profile chassis
Warranty documentation

Compliance Standards

EMC Emissions	EMC Immunity
FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment Canadian Standard ICES-003 is equivalent to CISPR22 Taiwanese Standard BSMI Japanese VCCI Australian C-Tick Korean (MIC)	CISPR 24:1997/EN 55024:1998 - Information Techı Equipment - Immunity Characteristics - Limits and Me Measurement

ATI Radeon HD 4550 Graphics Card

Bus type	PCI Express x16
Maximum vertical refresh rate	85 Hz
Display support	Integrated 400 MHz RAMDAC
Display max resolution	1900 x 1200 digital, 2048 x 1536 analog
Board display options	Supports two displays via included DMS-59 to dual VGA cable or 2 DVI monitors via optional DMS-59 to dual DVI cable kit part number: DL139A. 4-pin mini-DIN S-video connector for TV output

Board configuration

Specification	Description
Graphics Chip	RV710
Core clock	600 MHz
Memory clock	800 MHz
Frame buffer	512 MB DDR3, 64 bit wide

Languages supported	24 languages: English, Arabic, Chinese Simplified, Chinese Traditional, Czechoslovakian, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Thai, Turkish

Compliance standards

EMC Emissions	EMC Immunity
FCC Part 15, Subpart B – Unintentional Radiators, Class B Computing Devices for Home & Office Use	CISPR 24:1997/EN 55024:1998 – Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement
CISPR22: 1997/EN 55022:1998 – Class B – Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment	
Canadian Standard ICES-003 is equivalent to CISPR22	
Taiwanese Standard BSMI	
Japanese VCCI	
Australian C-Tick	
Korean (MIC)	

Resolutions Supported		Maximum Refresh Rate (Hz)	
	Resolution	Analog Connection	Digital Connection
	640x480	85	60
	800x600	85	60
	1024x768	85	60
	1280x720	85	60
	1280x1024	85	60
	1440x900	75	60
	1600x1200	85	60
	1680x1050	75	60
	1920x1080	85	60-R
	1920x1200	85	60-R
	1920x1440	85	N/A
	2048x1536	75	N/A
	2560x1600	N/A	N/A

Note:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Note:
60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

ATI Radeon HD 4650 Graphics Card

Bus type	PCI Express x16
Maximum vertical refresh rate	85 Hz
Display support	Integrated 400 MHz RAMDAC
Display max resolution	2560 x 1600 digital, 2048 x 1536 analog

Technical Specifications - Graphics

Resolutions Supported

Resolution	Maximum Refresh Rate (Hz)	
	Analog Connection	Digital Connection
640x480	85	60
800x600	85	60
1024x768	85	60
1280x720	85	60
1280x1024	85	60
1440x900	75	60
1600x1200	85	60
1680x1050	75	60
1920x1080	85	60-R
1920x1200	85	60-R
1920x1440	85	N/A
2048x1536	75	N/A
2560x1600	N/A	60*

* Only supported when using a dual-link DVI or DP connection

Note:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Note:
60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

Board display options

Supports two displays via included two DisplayPort and one Dual Link DVI-I connectors.

Board configuration

Specification	Description
Graphics Chip	RV635
Core clock	725 MHz
Memory clock	500 MHz
Frame buffer	1 GB DDR3, 128 bit wide

Core power

56 W

Board display options

Supports two displays via included two DisplayPort and one Dual Link DVI-I connectors.

Board configuration

EMC Emissions	EMC Immunity
FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment Canadian Standard ICES-003 is equivalent to CISPR22 Taiwanese Standard BSMI Japanese VCCI Australian C-Tick Korean (MIC)	CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement

HP ADD2 SDVO DVI-D Out PCI Express x1 Adapter Card

Form Factor

Low-profile card

DVI-D Connector

Digital connection only

Dual Head Support

Yes, when used with the integrated VGA connector

Display Devices Supported

HP L1740
HP L1940T
HP L2045W
HP LP1965

Note:
These graphics adapters offer optimal performance with any display that meets applicable VESA standards

Color Depth

All modes support 8-bpp, 16-bpp, and 24-bpp color depths

Host Interface Connector

Mechanically compliant with PCI-E standard
Complies with the Intel ADD2 and Intel Serial Digital Video Output (SDVO) specifications

Dot Clock

165 MHz maximum

Display Modes

Supports display modes that require up to 165-MHz bandwidth on the link, as shown in the following table.

Resolutions Supported

Resolution		60-Hz LCD	60-Hz	75-Hz	85-Hz
Blanking		5% reduced	GTF	GTF	GTF
640 x 480	VGA	Yes	Yes	Yes	Yes
800 x 600	SVGA	Yes	Yes	Yes	Yes
1024 x 768	XGA	Yes	Yes	Yes	Yes
1280 x 1024	SXGA	Yes	Yes	No	No
1600 x 1200	UXGA	Yes	Yes	No	No

HP DisplayPort to DVI-D Adapter

Connectors	DisplayPort and DVI-D single link connector
Adapter length	7.5 in (19.0 cm)
Adapter weight	.10 lbs (.05 kg)

HP DisplayPort to VGA Adapter

Connectors	DisplayPort and VGA connector
Adapter length	8 in (20 cm)
Adapter weight	.1 lbs (.06 kg)
Maximum vertical refresh rate	85 Hz
Display support	162 MHz RAMDAC
Display max resolution	1600x1200

Resolutions Supported

Resolution	Max refresh rate
640x480	85
800x600	85
1024x768	85
1280x720	85
1280x1024	85
1440x900	75
1600x1200	60
1680x1050	60
1920x1080	60-R
1920x1200	60-R

Note:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP. Usin DisplayPort to VGA Adapter may require an update to the graphics driver installed on your system. To install the most up-t graphics driver go to: www.hp.com.
Note:
60-R denotes reduced blanking timings are used. Not all monitors support reduced blanking timing.

160-GB 2.5" Hard Disk Drive

Capacity	160,041,885,696 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s
Buffer Size	8 MB
Logical Blocks	312,581,808
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 2.0 ms **Average:** 12 ms **Full-Stroke:** 22 ms
Height (nominal)	0.374 in/9.5 mm
Width (nominal)	Media diameter: 2.5 in/63.5 mm Physical size: 2.75 in/70 mm
Operating Temperature	41° to 131° F 5° to 55° C

250-GB 2.5" Hard Disk Drive

Capacity	250,059,350,016 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s
Buffer Size	8 MB
Logical Blocks	488,397,168
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 2.0 ms **Average:** 12 ms **Full-Stroke:** 22 ms
Height (nominal)	0.374 in/9.5 mm
Width (nominal)	Media diameter: 2.5 in/63.5 mm Physical size: 2.75 in/70 mm
Operating Temperature	41° to 131° F 5° to 55° C

Technical Specifications - Hard Drives

160-GB 3.5" Hard Disk Drive

Capacity	160,041,885,696 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s
Buffer Size	8 MB
Logical Blocks	312,581,808
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 0.9 ms **Average:** 9.3 ms **Full-Stroke:** 18 ms
Height (nominal)	1 in/2.54 cm
Width (nominal)	Media diameter: 3.5 in/8.89 cm Physical size: 4 in/10.2 cm
Operating Temperature	41° to 131° F 5° to 55° C

250-GB 3.5" Hard Disk Drive

Capacity	250,059,350,016 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s (limited by the system SATA controller)
Buffer Size	8 MB
Logical Blocks	488,397,168
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 1.0 ms **Average:** 8.5 ms **Full-Stroke:** 18 ms
Height (nominal)	1 in/2.54 cm
Width (nominal)	Media diameter: 3.5 in/8.89 cm Physical size: 4 in/10.2 cm
Operating Temperature	41° to 131° F (5° to 55° C)

Technical Specifications - Hard Drives

320-GB 3.5″ Hard Disk Drive

Capacity	320,069,031,690 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s
Buffer Size	8 MB
Logical Blocks	625,142,448
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 1.0 ms **Average:** 8.5 ms **Full-Stroke:** 18 ms
Height (nominal)	1 in/2.54 cm
Width (nominal)	Media diameter: 3.5 in/8.89 cm Physical size: 4 in/10.2 cm
Operating Temperature	41° to 131° F (5° to 55° C)

500-GB 3.5″ Hard Disk Drive

Capacity	500,107,862,016 bytes
Rotational Speed	7,200 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s (limited by the system SATA controller)
Buffer Size	16 MB
Logical Blocks	976,773,168
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 2.0 ms **Average:** 11 ms **Full-Stroke:** 21 ms
Height (nominal)	1 in/2.54 cm
Width (nominal)	Media diameter: 3.5 in/8.89 cm Physical size: 4 in/10.2 cm
Operating Temperature	41° to 131° F (5° to 55° C)

Technical Specifications - Hard Drives

160-GB 10,000 rpm Hard Disk Drive

Capacity	160,041,885,696 bytes
Rotational Speed	10,000 rpm
Interface	Serial ATA (SATA)
Synchronous Transfer Rate (Maximum)	Up to 3 GB/s (limited by the system SATA controller)
Buffer Size	16 MB
Logical Blocks	312,581,808
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:** 0.3 ms **Average:** 4.6 ms **Full-Stroke:** 10.2 ms
Height (nominal)	1 in/2.54 cm
Width (nominal)	Media diameter: 3.5 in/8.89 cm Physical size: 4 in/10.2 cm
Operating Temperature	41° to 131° F 5° to 55° C

64-GB 2.5" Solid State Drive

Capacity	64 GB
Interface	Serial ATA (SATA)
Architecture	Multi Level Cell (MLC) NAND Flash with wear leveling 10 channel controller
Internal transfer rate	**Write speed** Up to 220 MB/s **Read speed** Up to 120 MB/s
Host transfer rate	**Ultra DMA mode** Up to 150 MB/s
Power	**DC power requirement** 5 VDC 5%-100 mV ripple p-p **Total power consumption** <1.12Watt
Dimensions (W x H x D)	2.74 x 0.37 x 4 in/6.98 x 0.95 x 10.2 cm
Weight	0.14 lb/65 g
Environmental (all conditions, non-condensing)	**Operating Temperature:** 32° to 158° F (0° to 70° C) **Relative Humidity:** 5% to 95% **Maximum Wet Bulb Temperature** (operating) 84° F (29° C)

Note:
For solid state disk drives, GB means 1 billion bytes. 16GB is the unformatted capacity of this drive before a portion of the drive is reserved for flash management features. Actual capacity varies by content and will be less than 15.8GB.

80-GB 2.5″ Solid State Drive

Capacity	80-GB	
Interface	Serial ATA (SATA)	
Architecture	Multi Level Cell (MLC) NAND Flash with wear leveling 10 channel controller	
Dimensions (W x H x D)	2.74 x 0.37 x 4 in/6.98 x 0.95 x 10.2 cm	
Weight	0.18 lb/80 g	
Bandwidth Performance	**Sustained Sequential Read:**	Up to 250 MB/s
	Sustained Sequential Write:	Up to 70 MB/s
	Random Read:	Up to 35K IOPs
	Random Write:	Up to 6.6K IOPs
Latency	**Read:**	65-ms
	Write:	85-ms
Power	**DC power requirement**	5 VDC 5%-100 mV ripple p-p
	Total power consumption	0.15W (active); 0.075W (idle)
Useful Drive Life	35TB written, up to 20GB/day for 5 years	
Environmental (all conditions, non-condensing)	**Operating Temperature**:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Maximum Wet Bulb Temperature (operating)	84° F (29° C)
	Shock:	1,500 G/0.5-ms

Note:
For solid state disk drives, GB means 1 billion bytes. 16GB is the unformatted capacity of this drive before a portion of the drive is reserved for flash management features. Actual capacity varies by content and will be less than 15.8GB.

HP USB Standard Keyboard

Physical characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
	Dimensions (L x W x H)	18.0 x 6.4 x 0.98 in 45.8 x 16.3 x 2.5 cm
	Weight	2 lb 0.9 kg
Electrical	Operating voltage	+ 5VDC ± 5%
	Power consumption	50-mA maximum (with three LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI – RFI	Conforms to FCC rules for a Class B computing device
	Microsoft® PC 99 – 2001	Functionally compliant
Mechanical	Languages	38 available
	Keycaps	Low-profile design
	Switch actuation	55-g nominal peak force with tactile feedback
	Switch life	20 million keystrokes (using Hasco modified tester)
	Switch type	Contamination-resistant switch membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	6 ft (1.8 m)
	Microsoft PC 99 –2001	Mechanically compliant
Environmental	Acoustics	43-dBA maximum sound pressure level
	Operating temperature	50° to 122° F (10° to 50° C)
	Non-operating temperature	-22° to 140° F (-30° to 60° C)
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	20% to 80% (non-condensing at ambient)
	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence

Technical Specifications - Input Devices

Approvals	UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC	
Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	
Kit contents	Keyboard	Installation Guide
	Warranty Card	Safety and Comfort Guide

HP PS/2 Standard Keyboard

Physical characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
	Dimensions (L x W x H)	18.0 x 6.4 x 0.98 in 45.8 x 16.3 x 2.5 cm
	Weight	2 lb 0.9 kg minimum
Electrical	Operating voltage	+ 5VDC ± 5%
	Power consumption	50-mA maximum (with three LEDs ON)
	System interface	PS/2 6-pin mini din connector
	ESD	CE level 4, 15-kV air discharge
	EMI – RFI	Conforms to FCC rules for a Class B computing device
	Microsoft® PC 99 – 2001	Functionally compliant
Mechanical	Languages	38 available
	Keycaps	Low-profile design
	Switch actuation	55-g nominal peak force with tactile feedback
	Switch life	20 million keystrokes (using Hasco modified tester)
	Switch type	Contamination-resistant switch membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	6 ft 1.8 m
	Microsoft PC 99 –2001	Mechanically compliant
	Acoustics	43-dBA maximum sound pressure level
	Operating temperature	50° to 122° F (10° to 50° C)
	Non-operating temperature	-22° to 140° F (-30° to 60° C)
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	20% to 80% (non-condensing at ambient)

Environmental	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence
Approvals	UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC	
Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	
Kit contents	Keyboard	Installation Guide
	Warranty Card	Safety and Comfort Guide

HP USB SmartCard Keyboard

Physical characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
	Form factor	USB basic Smart Card keyboard
	Colors	Carbonite/Silver
	Dimensions (H x W x D)	18.2 x 6.3 x 1.3 in 46.3 x 16.1 x 3.3 cm
	Weight	2 lb (0.9 kg) minimum
Electrical	Operating voltage	+ 5VDC ± 5%
	Power consumption	100-mA maximum (with four LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC 99 - 2001	Functionally compliant
Mechanical	Languages	30+ available
	Keycaps	Low-profile design
	Switch actuation	55 g nominal peak force with tactile feedback
	Switch life	20 million keystrokes (using Hasco modified tester)
	Switch type	Contamination-resistant membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	6 ft (1.8 m)
	Microsoft PC 99 - 2001	Mechanically compliant
	Acoustics	43-dBA maximum sound pressure level
	Operating temperature	50° to 122° F (10° to 50° C)
	Non-operating temperature	-22° to 140° F (-30° to 60° C)
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	20% to 80% (non-condensing at ambient)

Technical Specifications - Input Devices

Environmental	Operating shock	40 g, six surfaces	
	Non-operating shock	80 g, six surfaces	
	Operating vibration	2-g peak acceleration	
	Non-operating vibration	4-g peak acceleration	
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence	
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence	
SMARTCARD function	Support	All ISO 7816 smart cards	
	Interface	Reads from and writes to all ISO7816-1, 2, 3, 4 memory and microprocessor smart cards (T=0, T=1)	
	Chipset	SCM STCII	
	Standard APIs supported	PC/SC, EMV2000, SET	
	Power	USB Port Short circuit detection (protects smart card and reader) Power supply compliant with ISO7816 and EMV (5V, 60 mA) Supports 3-V and 5-V cards	
	Power consumption	250-mA maximum draw (50 mA for the keyboard with three LEDs ON and 200-mA maximum startup current using a high-current, 60-mA smart card)	
	Communication	From card	Programmable from 9,600 baud to 115,200 baud
		From computer	Up to 38,400 baud
	Landing mechanism	Contact device	Friction contact
		Card insertions rating	Up to 100,000 insertion cycles
	Interface modes	USB communications through USB port SCM protocol Automatic card insertion/removal detection	
	Reader performance interface	USB connection	
	Electro-magnetic standards	Europe	89/336/CEE guideline
		USA	USAFCC part 15

HP USB & PS2 Washable Keyboard

Physical Characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
	Dimensions (L x W x H)	18.0 x 6.4 x 0.98 in 45.8 x 16.3 x 2.5 cm
	Weight	2 lb (0.9 kg) minimum
Electrical	Operating voltage	+ 5VDC ±5%
	Power consumption	50-mA maximum (with three LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device

	Microsoft® PC 99 - 2001	Functionally compliant
Mechanical	Keycaps	Stepped -profile design
	Switch actuation	55-g nominal peak force with tactile feedback
	Switch life	20 million keystrokes
	Switch type	Contamination-resistant switch membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	7 ft 2.2 m
	Microsoft PC 99 - 2001	Mechanically compliant
	Acoustics	43-dBA maximum sound pressure level
Environmental	Operating temperature	50° to 122° F 10° to 50° C
	Non-operating temperature	-4° to 149° F -20° to 65° C
	Operating humidity	10% to 95% (non-condensing at ambient)
	Non-operating humidity	0% to 95% (non-condensing at ambient)
	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence
Approvals	UL, cUL, FCC, CE, TUV GS, VCCI, BSMI, C-Tick, KCC, USB-IF, WHQL, EN/IEC 60601-1, IP66/NEMA4X	
Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	

HP Smart Card CCID Keyboard

Physical Characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country
	Form factor	USB basic smart card keyboard
	Colors	Carbonite/Silver
	Dimensions (H x W x D)	18.2 x 6.3 x 1.3 in 46.3 x 16.1 x 3.3 cm
	Weight	2 lb 0.9 kg minimum
	Operating voltage	+ 5VDC ± 5%

Technical Specifications - Input Devices

Electrical	Power consumption	100-mA maximum (with four LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC 99 - 2001	Functionally compliant
Mechanical	Languages	30+ available
	Keycaps	Standard design
	Switch actuation	55 g nominal peak force with tactile feedback
	Switch life	20 million keystrokes (using Hasco modified tester)
	Switch type	Contamination-resistant membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	6 ft 1.8 m
	Microsoft PC 99 - 2001	Mechanically compliant
Environmental	Acoustics	43-dBA maximum sound pressure level
	Operating temperature	50° to 122° F 10° to 50° C
	Non-operating temperature	-22° to 140° F -30° to 60° C
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	20% to 80% (non-condensing at ambient)
	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence
SmartCard Function	Support	All ISO 7816 smart cards
	Interface	Reads from and writes to all ISO7816-1, 2, 3, 4 memory and microprocessor smart cards (T=0, T=1)
	Chipset	SCM STCIII
	Standard APIs supported	PC/SC, EMV2000, CT-API
	Power	USB Port Short circuit detection (protects smart card and reader) Power supply compliant with ISO7816 and EMV (5V, 60 mA) Supports 3-V and 5-V cards
	Power consumption	100-mA maximum draw
	Communication	From card: 9600 bps to 330,000 bps From computer: 12 Mbps (USB transfer speed)

	Landing mechanism	Contact device	Friction contact
		Card insertions rating	Up to 100,000 insertion cycles
	Interface modes	CCID protocol	
	Reader performance interface	USB connection	
	Electro-magnetic standards	Europe	2004/108/EC
		USA	USAFCC part 15
Approvals	CE-Mark, UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC, EMV2000, USB-IF		
Ergonomic Compliance	ISO 9241-4, TUVGS		
Smart Card Compatibility	HP	HP ProtectTools Smart Card	
	American Express	Amex Blue	
	Axalto (Schlumberger)	Cryptoflex 8K Cryptoflex 16K Cryptoflex 32K Cryptoflex 32K e-gate Cyberflex Access 64K Cyberflex Access 32K Cyberflex 32K e-gate Cyberflex 64K Cyberflex Palmera Payflex-S Payflex 1K Payflex 2K Payflex 4K Payflex 8K Prismera US DoD CAC PrimeFlex Store 8K PrimeFlex Store 2K	
	Cardlogix	CLXSU004KK4 CLXSU008KK5	
	Safenet, Inc.	Model 300 Model 330	
	De-La Rue	VisaCash	
	Gemplus	Gem Expresso GKK32K Gemclub Memo GemClub Micro GemXplore GemSafe	
	Infineon	SLE66C322P SLE4406 SLE4406E SLE4406E SE SLE4418 SLE4428 SLE4432 SLE4436E SLE4442	

		SLE5536
	SafLink (Litronic)	Forte
	Shart	Java Card
	Oberthur	CosmopolIIC v4 CosmopolIIC v4.1 Cosmo ID-One GalatIIC v2.1 US DoD CAC
	Memory Cards	
	Atmel	AT24C01ASC AT24C02SC AT24C04SC AT24C08SC AT24C16SC AT24C32SC AT24C64SC AT24C128SC AT24C256SC AT24C512SC AT88SC153 AT88SC1608
	ISSI	IS23SC4418 IS23SC4428
	ST	14C02
	Telefonkarte	SLE4406 SLE4436 SLE5536
	XICOR	X24026

HP PS/2 Optical Mouse

Dimensions (H x L x W)		1.56 x 2.44 x 4.61 in 3.95 x 6.21 x 11.7 cm
Weight		4.44 oz 126 g
Environmental	Operating temperature	-32° to 104°F 0° to 40° C
	Non-operating temperature	-4° to 140°F -20° to 60° C
	Operating humidity	10% to 90% (non condensing at ambient)
	Non-operating humidity	10% to 90% (non condensing at ambient)
	Operating shock	40 g, 6 surfaces

	Non-operating shock	80 g, 6 surfaces
	Operating vibration	2 g peak acceleration
	Non-operating vibration	4 g peak acceleration
	Drop (out of box)	80 cm height onto asphalt tile over concrete or equivalent, 5-drop in 5 direction except the cable face
Electrical	Operating voltage	5 VDC ± 10%
	Power consumption	100mA
	System consumption	PS/2 mini-din connector
	ESD	CE level 4, 15 kV air discharge
	EMI-RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC99 - 2001	Functionally compliant
	Resolution	400 ± 20% DPI
	Tracking speed	10 in/s (25.4 cm/s) maximum
	Acceleration	100 in/s/s (2.54 m/s/s)
	Switch actuation	61 g nominal peak force
Mechanical	Switch life	3,000,000 operations (using Hasco modified tester)
	Switch type	Low force micro-switches
	Tracking mechanism life	155 mi (250 km) at average speed of 10 in/s
	Cable length	6 ft (1.8 m)
	Microsoft PC99 - 2001	Mechanically compliant
	Width	8 mm
	Diameter	1.01 in (25.6 mm)
Scroll wheel	Maximum rotation speed	48 rats/sec
	Switch type	Light force micro-switch
	Switch life	1 million operations
	Mechanical life	Minimum 200,000 revolutions
Regulatory approvals	Compliant	UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC

HP USB Optical Mouse

Dimensions (H x L x W)	1.5 x 4.5 x 2.5 in 3.8 x 11.6 x 6.3 cm
Weight	0.27 lb 0.12 kg
Cable length	72.8 in 185 cm
System requirements	Microsoft Windows 95, 98, 2000, Me, XP and Vista Available USB port

HP USB Laser Mouse

Scroll Wheel	24	
Maximum Rotation Speed	48 rats/sec	
Switch Type	wheel	
Switch Life	Button – 3,000,000 Wheel – 1,000,000 times Tilt switch – 500,000 times	
Environmental	Operating Temperature	32° to 104° F 0° to 40° C
	Non-operating Temperature	-4° to 140° F -20° to 60° C
	Operating Humidity	10% to 90% (non-condensing at ambient)
	Non-operating Humidity	20% to 80% (non-condensing at ambient)
	Operating Shock	40 g, six surfaces
	Non-operating Shock	80 g, six surfaces
	Operating Vibration	2-g peak acceleration
	Non-operating Vibration	4-g peak acceleration
Electrical	Operating Voltage	+ 5VDC ± 5%
	Power Consumption	
	MTBF	> 150,000 hrs
	ESD	IEC-61000-4-2 criteria B, Contact discharge: +/- 4kV, Air discharge: +/- 8kV
	EMI-RFI	FCC Class B

	PC98	PC 99 Compliant
Mechanical	Resolution	800dpi
	Tracking Speed	25 cm/sec
	Acceleration	0.5mm
	Switch Actuation	0.6N (60gf)
	Switch Life	Button – 3,000,000 Wheel – 1,000,000 times Tilt switch – 500,000 times
	Cable Length	1850mm
	PC98-99	PC99 compliant
Regulatory Approvals	UL60950-1, UL 94, UL 746 (A-E), UL 796 TUV/GS: EN 60950-1, EN 60825-1 FCC Class B, UL 1950, cUL, TUV GS, CE, C-tick, VCCI, BSMI, RRL	

HP Blu-ray Writer Drive

AMO Part Number	AR482AA		
Height	5.25-inch, half-height, tray-load		
Orientation	Either horizontal or vertical		
Interface type	SATA		
Disc capacity	50 GB DL or 25 GB standard		
Dimensions (W x H x D)	5.9 x 1.7 x 7.5 in 15.0 x 4.4 x 19.0 cm		
Weight (max)	2.0 lb 907g		
Disc Capacity	DVD-ROM	8.5GB DL or 4.7GB standard	
	Blu-ray	50GB DL or 25GB standard	
Startup Time	Full Stroke DVD	< 250 ms (seek)	
	Full Stroke CD	< 210 ms (seek)	
	Blu-ray	< 275 ms (seek)	
		(Time to drive ready from tray loading)	
		BD-ROM (SL/DL)	25S / 28S
		BD-R (SL/DL)	25S / 28S
		BD-RE (SL/DL)	25S / 28S
		DVD-ROM (SL/DL)	18S / 18S
		DVD-R (SL/DL)	25S / 25S
		DVD-RW	25S
		DVD+R (SL/DL)	25S / 25S
		DVD+RW	25S
		DVD-RAM	45S
		CD-ROM	15S
Maximum Data Transfer Rates	CD-ROM Read	CD-ROM up to 40X CD-RW up to 40X 8x CAV DVD-RAM up to 5X DVD+RW up to 10X DVD-RW up to 10X DVD+R DL up to 8X	
	DVD-ROM Read	DVD-R DL up to 8X DVD-ROM up to 16X DVD-ROM DL up to 8X DVD+R up to 12X DVD-R up to 12X BD-ROM up to 6X BD-ROM DL up to 4.8X	

Technical Specifications - Optical Storage

Power	Blu-ray	BD-R up to 6X BD-R DL up to 4.8X BD-R up to 6X BD-RE SL/DL up to 4.8X
	Source	SATA DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
	DC Current	5 VDC -1000 mA typical, 1600 mA maximum 12 VDC -600 mA typical, 1400 mA maximum
Environmental (all conditions non-condensing)	Temperature (operating)	41° to 122° F (5° to 50° C)
	Relative Humidity (operating)	10% to 90%
	Maximum Wet Bulb Temperature (operating)	86° F (30° C)

HP SuperMulti LightScribe Drive

AMO Part Number	AR630AT		
Height	5.25-inch, half-height, tray-load		
Orientation	Either horizontal or vertical		
Interface type	Serial ATA		
Dimensions (W x H x D)	5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm)		
Weight (max)	2.6 lb (1.2 kg)		
	CD Media Read Access	Random	< 120 ms typical
		Full Stroke	< 200 ms typical
	DVD Media Read Access	Random	< 130 ms typical
		Full Stroke	< 240 ms typical
	CD Media Read Transfer	CD-ROM, CD-R Read	Up to 6000 KB/s (40X)
		CD-RW Read	Up to 4800 KB/s (32X)
		Digital/Analog Audio Playback	Up to 2400 KB/s (16X)
		Digital Audio Extraction (CD-ROM, CD-R)	Up to 6000 KB/s (40X)
		Digital Audio Extraction (CD-RW)	Up to 4800 KB/s (32X)
		Video CD Playback	Up to 2400 KB/s (16X)
	DVD Media Read Transfer	DVD-ROM SL Read	Up to 21600 KB/s (16X)
		DVD-ROM DL Read	Up to 10800 KB/s (8X)
		DVD Video Playback	Up to 10800 KB/s (8X)
		DVD Video SL (other than playback)	Up to 21600 KB/s (16X)
		DVD Video DL (other than playback)	Up to 10800 KB/s (8X)

Performance		DVD-R	Up to 21600 KB/s (16X)
		DVD+R	Up to 21600 KB/s (16X)
		DVD-RW	Up to 10800 KB/s (8X)
		DVD-R DL	Up to 10800 KB/s (8X)
		DVD+RW	Up to 10800 KB/s (8X)
		CD-R Write	Up to 6000 KB/s (40X)
		CD-RW	600 KB/s (4X)
	CD Media Write Transfer	CD-RW (High speed)	1500 KB/s (10X)
		CD-RW (Ultra speed)	Up to 3600 KB/s (24X)
		CD-RW (Ultra speed+)	Up to 4800 KB/s (32X)
		DVD+R	Up to 21600 KB/s (16X)
		DVD+R DL (v1.2)	Up to 16200 KB/s (12X)
		DVD+R DL (v1.1)	Up to 10800 KB/s (8X)
		DVD+RW (Volume 2 v1.0)	Up to 10800 KB/s (8X)
		DVD+RW (Volume 1 v1.3)	Up to 5400 KB/s (4X)
		DVD-R (v2.1 rev. 6.0)	Up to 16200 KB/s (12X)
	DVD Media Write Transfer	DVD-R (v2.1 rev. 4.0)	Up to 21600 KB/s (16X)
		DVD-R DL (v3.0 rev. 5.0)	Up to 10800 KB/s (8X)
		DVD-R DL (v3.0 rev. 3.0)	Up to 10800 KB/s (8X)
		DVD-RW (v1.2 rev. 3.0)	8100 KB/s (6X)
		DVD-RW (v1.2 rev. 2.0)	Up to 5400 KB/s (4X)
		DVD-RAM (v2.2 rev. 5.0)	Up to 16200 KB/s (12X)
		DVD-RAM (v2.2 rev. 2.0)	Up to 6750 KB/s (5X)
	Supported Media Types	LightScribe CD-R Version 1.2 LightScribe DVD-R Version 1.2 LightScribe DVD+R Version 1.2	
LightScribe Direct Disc Labeling	Print Levels and Print Time (12cm Media – Full Label)	Best	CD < 28 minutes DVD < 30 minutes
		Normal	CD < 24 minutes DVD < 26 mintutes
		Draft	CD < 20 minutes DVD < 22 minutes

Media Compatibility	Media	Read	Write
	CD-ROM	Yes	No
	CD-R	Yes	No
	CD-RW	Yes	No
	DVD-ROM	Yes	No
	DVD-ROM DL	Yes	No
	DVD-RAM	Yes	No
	DVD+R	Yes	No
	DVD+R DL	Yes	No
	DVD+RW	Yes	No

Technical Specifications - Optical Storage

	DVD-R	Yes	No
	DVD-RW	Yes	No
	DVD-R DL	Yes	No
Power Supply	Source	SATA DC power receptacle	
	DC Power Requirement	5 VDC ± 5%	100 mV ripple p-p
		12 VDC ± 5%	200 mV ripple p-p
	DC Current	5 VDC	<1000 mA (typical) 1600 mA (max.)
		12 VDC	1200 mA (typical) 2000 mA (max.)
		Total Drive Power (Standby Mode)	< 2.5W
Rear Panel	SATA Power Connector, 15-pin SATA Data Connector, 7-pin Markings to identify each connector		
Environmental conditions (all conditions non-condensing)	Temperature (operating)	41° to 122° F (5° to 50° C)	
	Temperature (storage)	–22° F to 140° F (–30° C to 60° C)	
	Relative Humidity	10% to 90%	
	Maximum Wet Bulb Temperature	86° F (30° C)	
	Altitude	0 to 10,171 ft. (0 to 3,100 meters)	

HP DVD-ROM Drive

AMO Part Number	AR629AA		
Height	5.25-inch, half-height, tray-load		
Orientation	Either horizontal or vertical		
Interface type	Serial ATA		
Dimensions (W x H x D)	5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm)		
Weight (max)	2.6 lb (1.2 kg)		
	CD Media Read Access	Random	< 120 ms typical
		Full Stroke	< 200 ms typical
	DVD Media Read Access	Random	< 130 ms typical
		Full Stroke	< 240 ms typical
		CD-ROM, CD-R Read	Up to 6000 KB/s (40X)
		CD-RW Read	Up to 4800 KB/s (32X)
		Digital/Analog Audio Playback	Up to 2400 KB/s (16X)

Technical Specifications - Optical Storage

Performance	CD Media Read Transfer	Digital Audio Extraction (CD-ROM, CD-R)	Up to 6000 KB/s (40X)
		Digital Audio Extraction (CD-RW)	Up to 4800 KB/s (32X)
		Video CD Playback	Up to 2400 KB/s (16X)
	DVD Media Read Transfer	DVD-ROM SL Read	Up to 21600 KB/s (16X)
		DVD-ROM DL Read	Up to 10800 KB/s (8X)
		DVD Video Playback	Up to 10800 KB/s (8X)
		DVD Video SL (other than playback)	Up to 21600 KB/s (16X)
		DVD Video DL (other than playback)	Up to 10800 KB/s (8X)
		DVD-R	Up to 21600 KB/s (16X)
		DVD+R	Up to 21600 KB/s (16X)
		DVD-RW	Up to 10800 KB/s (8X)
		DVD-R DL	Up to 10800 KB/s (8X)
		DVD+RW	Up to 10800 KB/s (8X)

	Media	Read	Write
Media Compatibility	CD-ROM	Yes	No
	CD-R	Yes	No
	CD-RW	Yes	No
	DVD-ROM	Yes	No
	DVD-ROM DL	Yes	No
	DVD-RAM	Yes	No
	DVD+R	Yes	No
	DVD+R DL	Yes	No
	DVD+RW	Yes	No
	DVD-R	Yes	No
	DVD-RW	Yes	No
	DVD-R DL	Yes	No

Power Supply	Source	SATA DC power receptacle	
	DC Power Requirement	5 VDC ± 5%	100 mV ripple p-p
		12 VDC ± 5%	200 mV ripple p-p
	DC Current	5 VDC	<1000 mA (typical) 1600 mA (max.)
		12 VDC	1200 mA (typical) 2000 mA (max.)
		Total Drive Power (Standby Mode)	< 2.5W
Rear Panel	SATA Power Connector, 15-pin SATA Data Connector, 7-pin Markings to identify each connector		
	Temperature	41° to 122° F	

Environmental conditions (all conditions non-condensing)	(operating) Temperature	(5° to 50° C)
	(storage) Temperature	–22° F to 140° F (–30° C to 60° C)
	Relative Humidity	10% to 90%
	Maximum Wet Bulb Temperature	86° F (30° C)
	Altitude	0 to 10,171 ft. (0 to 3,100 meters)

HP Slim SuperMulti LightScribe Drive

AMO Part Number	VP034AA	
Height	12.7mm height	
Orientation	Either horizontal or vertical	
Interface type	SATA/ATAPI	
Disc recording capacity	Up to 8.5 GB DL or 4.7 GB standard	
Dimensions (W x H x D)	5.0 x 0.5 x 5.0 in (128 x 13.6 x 129 mm)	
Weight (max)	0.42 lb (190 g)	
Write speeds	DVD-RAM	Up to 5X
	DVD-R DL	Up to 4X
	DVD+R	Up to 8X
	DVD+RW	Up to 4X
	DVD+R DL	Up to 4X
	DVD-R	Up to 8X
	DVD-RW	Up to 6X
	CD-R	Up to 24X
	CD-RW	Up to 16X
Read speeds	DVD-RAM	Up to 5X
	DVD-RW, DVD+RW	Up to 8X
	DVD-R DL, DVD+R DL	Up to 6X
	DVD+R, DVD-R	Up to 8X
	DVD-ROM DL, DVD-ROM	Up to 8X
	CD-ROM, CD-R	Up to 24X
	CD-RW	Up to 24X
Access time	Random	DVD: < 140 ms (typical), CD: < 125 ms (typical)

Technical Specifications - Optical Storage

(typical reads, including settling)	Full Stroke	DVD: < 250 ms (seek), CD: < 210 ms (seek)
	Stop Time	< 4 seconds
	Cache Buffer	2 MB (minimum)
	Data Transfer Modes	ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s); ATA UltraDMA Mode 3 (44.4 MB/s - default)
Power	Source	Four-pin, DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p
		12 VDC ± 5%-200 mV ripple p-p
	DC Current	5 VDC (< 1000 mA typical, 1600 mA maximum)
		12 VDC (< 600 mA typical, 1400 mA maximum)
	Total Drive Power (standby mode)	< 2.5 Watt
Audio output	Line-Out	0.7 VRMS
	Signal-to-Noise Ratio	74 dB
	Channel Separation	65 dB
Environmental conditions (operating - non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 90%
	Maximum Wet Bulb Temperature	86° F (30° C)

HP Slim DVD-ROM Drive

AMO Part Number	VP033AA	
Height	12.7mm	
Orientation	Either horizontal or vertical	
Interface type	SATA/ATAPI	
Dimensions (W x H x D)	5.0 x 0.5 x 5.0 in (128 x 13.6 x 129 mm)	
Weight (max)	0.42 lb (190 g)	
Read speeds	DVD+R/-R/+RW/ -RW/+R DL /-R DL	Up to 4X
	DVD-ROM	Up to 8X
	CD-ROM, CD-R	Up to 24X
	CD-RW	Up to 24X

Technical Specifications - Optical Storage

Access time (typical reads, including settling)	**Random DVD**	DVD: < 140 ms (typical), CD: < 125 ms (typical)
	Random CD	DVD: < 250 ms (seek), CD: < 210 ms (seek)
	Data Transfer Modes	ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s)
Power	**Source**	Four-pin, DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum
	Total Drive Power (standby mode)	< 2.5 Watt
Audio output	**Line-Out**	0.7 VRMS
	Signal-to-Noise Ratio	74 dB
	Channel Separation	65 dB
Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative Humidity	5% to 85%
	Maximum Wet Bulb Temperature (operating)	86° F (30° C)

HP 22-n-1 Media Card Reader plus 1394 Media Card Reader

USB Interface	USB 2.0 High-speed interface
	Note: Requires the USB cable to be connected to the internal USB 2.0 port or a USB 2.0 PCI card.
1394 Interface	Two IEEE-1394a external ports; 1 IEEE-1394a internal port (connects to the pass through cable on the media card reader)
Advance protocol support	Supports hardware ECC (Error Correction Code) function
	Supports hardware CRC (Cyclic Redundancy Check) function
	Supports MS 4-bit parallel transfer mode
	Supports MS-PRO 4-bit parallel transfer mode
	Supports MS PRO-HG Duo 4-bit parallel transfer mode
	Supports SD 4-bit parallel transfer mode
	Supports high-speed 50Mhz SD 4-bit card (version 2.0)
	Supports high-speed 52Mhz MMC 8-bit card (version 4.2)
	Supports CF v4.0 with PIO mode 6 and Ultra DMA mode
Supported media type	CompactFlash Type I
	CompactFlash Type II
	Microdrive
	MultiMediaCard (MMC)
	Reduced Size MultiMediaCard (RS MMC)
	MultiMediaCard 4.2 (MMC Plus, including MMC Plus HC)
	Reduced Size MultiMediaCard 4.2 (MMC Mobile, including MMC Mobile HC)
	Secure Digital Card (SD)
	Secure Digital High Capacity (SDHC)
	miniSD
	miniSD High Capacity
	Micro SD (T-Flash)
	Micro SD HC
	Memory Stick
	Memory Stick Select
	Memory Stick Duo (MS Duo)
	Memory Stick PRO (MS PRO)

Supported media type with card adapter	Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo MagicGate Memory Stick (MG) MagicGate Memory Stick Duo xD-Picture Card Memory Stick Micro (M2) MMC Micro	
Environmental	Operational Environmental Extremes	Test Parameters/Conditions - Power applied, unit operating on system ±5% nominal supply voltage. 10°C 10% R.H. = 24 hours 10°C 90% R.H. = 24 hours 20°C 90% R.H. = 24 hours 30°C 90% R.H. = 24 hours 40°C 90% R.H. = 24 hours 50°C 90% R.H. = 24 hours 50°C 10% R.H. = 24 hours
	Storage Environmental Extremes	Test Parameters/Conditions 140°F (60°C) @ 80% R.H. for 96 hours -22°F (-30°C) @ 20% R.H. for 48 hours No power applied Delta °C < 1.0°C/min Delta % R.H. < 1.5% R.H./min
Approvals	USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0 Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3 FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUV-T	

Eco-Label Certifications & declarations

This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

- US ENERGY STAR ®
- IT ECO declaration
- EPEAT Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country

Ultra-Slim Desktop

Energy Consumption (typically configured)	115 VAC	230 VAC	100 VAC
Normal Operation	26.96 W	27.61 W	27.12 W
Sleep (Energy Star low power mode)	3.585 W	3.63 W	3.582 W
Off	1.361 W	1.411 W	1.359 W

Heat Dissipation*	115 VAC	230 VAC	100 VAC
Normal Operation	92 BTU/hr	94 BTU/hr	93 BTU/hr
Sleep	12 BTU/hr	12 BTU/hr	12 BTU/hr
Off	5 BTU/hr	5 BTU/hr	5 BTU/hr

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Declared Noise Emissions
(in accordance with ISO 7779 and ISO 9296)

System Fan Off	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Idle	3.8	28
Fixed Disk (random writes)	3.8	28

Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

Battery size: CR2032 (coin cell)
Battery type: Lithium

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see: www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and

ISO1043.

- This product contains 0.40% post consumer recycled plastic (by wt.)
- This product is 92.3% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated –3637.5 g
- Internal:
  - Polyethylene low density – 7.6 g
- The corrugated packaging material contains at least 80% recycled content.
- The corrugated packaging material contains at least 0% recycled content.

Small Form Factor

Energy Consumption (typically configured)	115 VAC	230 VAC	100 VAC
Normal Operation	41.4254 W	40.8627 W	41.5632 W
Sleep (Energy Star low power mode)	2.7652 W	2.9789 W	2.7294 W
Off	1.3332 W	1.4949 W	1.3320 W

Heat Dissipation*	115 VAC	230 VAC	100 VAC
Normal Operation	142 BTU/hr	140 BTU/hr	142 BTU/hr
Sleep	9 BTU/hr	10 BTU/hr	9 BTU/hr
Off	5 BTU/hr	5 BTU/hr	5 BTU/hr

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Declared Noise Emissions
(in accordance with ISO 7779 and ISO 9296)

System Fan Off	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Idle	3.7	27
Fixed Disk (random writes)	3.7	27

Technical Specifications - Environmental Data

Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

Battery size: CR2032 (coin cell)
Battery type: Lithium

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- This product contains 0% post consumer recycled plastic (by wt.)
- This product is 86.2% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated Carton – 1362 g
  - Corrugated – 343 g
- Internal:
  - EPE – Expanded Polyethylene – 198 g
  - Polyethylene low density foam – 39 g
- The Corrugated Carton packaging material is made from 75% recycled content.
- The EPE – Expanded Polyethylene packaging material is made from 100% recycled content.
- The Polyethylene low density foam packaging material is made from 100% recycled content.

Convertible Minitower

Energy Consumption (typically configured)	115 VAC	230 VAC	100 VAC
Normal Operation	42.224 W	42.076 W	42.366 W
Sleep (Energy Star low power mode)	2.962 W	2.886 W	2.894 W
Off	0.646 W	0.802 W	0.652 W

Heat Dissipation*	115 VAC	230 VAC	100 VAC
Normal Operation	144 BTU/hr	144 BTU/hr	145 BTU/hr
Sleep	10 BTU/hr	10 BTU/hr	10 BTU/hr
Off	2 BTU/hr	3 BTU/hr	2 BTU/hr

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Technical Specifications - Environmental Data

Declared Noise Emissions
(in accordance with ISO 7779 and ISO 9296)

System Fan Off	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Idle	3.8	28
Fixed Disk (random writes)	3.8	28

Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

Battery size: CR2032 (coin cell)
Battery type: Lithium

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- This product contains 0% post consumer recycled plastic (by wt.)
- This product is 91.7% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated – 2550g
- Internal:
  - Polyethylene high density – 160g
- The Corrugated packaging material is made from 38% recycled content.
- The Polyethylene high density packaging material is made from 100% recycled content.

All Models

RoHS Compliance

Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis. By July 1, 2006, RoHS substances will be virtually eliminated (virtually = to levels below legal limits) for all HP electronic products subject to the RoHS Directive, except where it is widely recognized that there is no technically feasible alternative (as indicated by an exemption under the EU RoHS Directive).

Material Usage

This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at: http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html):

- Asbestos
- Certain Azo Colorants

- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)
- Nickel finishes that release greater than 0.5 micro-grams/cm^2/week, measured according to EN 1811:1998, are not used on any product surface designed to be frequently handled or touched by users.

Packaging

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

End-of-life Management and Recycling

Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

Hewlett-Packard Corporate Environmental Information

For more information about HP's commitment to the environment:
Global Citizenship Report
http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Eco-label certifications
http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html
ISO 14001 certificates:
http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html

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